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Acute Radiation Effects on Individual Crewmember Performance

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Acute Radiation Effects on Individual Crewmember Performance

Pacific-Sierra Research Corporation
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between dose/time and the task performance estimates provided by supervisors of combat crews.

We focus on soldiers representing four different crews, from the artillery (both gun and fire direction center crews), armor, and antiarmor, because their operations include the prospect of decisive encounters where one of the combatant crews will probably be put out of action. The crews are small, with three or four members, and the encounters are usually brief, typically lasting between 30 and 90 sec. so crew missions, operational scenarios, and crewmembers' tasks can be readily modeled.

Performance data from questionnaires administered to 161 senior noncommissioned officers from the combat crews were evaluated. Twenty-four respondents were excluded because of either lack of experience, background, self-disqualification, or missing questionnaires. Another 21 were rejected because of noncompliance with instructions or unreasonable response patterns, leaving a total of 116, or 73 percent.

A linear regression analysis is performed on respondent data to obtain the parameters for predicting performance of each of the 15 crewmember positions. The logit form is used to model the response data, so as to guarantee that all predicted performance values, including the upper and lower confidence limits, lie within the interval (0, 1), as consistent with the dependent variable (performance) input data.

Performance predictions are mapped onto the dose/time plane with specified boundary conditions by applying numerical techniques to a framework of symptom complexes. Three-dimensional representations of performance as a function of dose and time are developed for 15 crewmember positions by applying a "french curve" algorithm to translate performance data input on a grid of 18 dose by 39 time points into a smooth surface. A similar numerical procedure was used to generate isoperformance contour plots that are 10 percent incremental coplanar projections of the performance surface onto the dose/time plane.

Computed performance, given in both graphic and tabular form, is consistent with the acute symptomatology from medical observations. Also, despite the subjective basis of the performance estimates correlated with dose and time, the computed results represent reasonable expectations. Physically demanding tasks are associated with greater performance degradation; crewmembers with similar tasks across crews indicate correlated degradation when grouped. Since we find it difficult to stipulate a sound comprehensive measure of uncertainty in the results we present, the results should be applied with caution.

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SUMMARY

In this report, quantitative estimates of the performance levels of individual combat crewmembers exposed to prompt ionizing radiation are developed. The data described here are designed to help plan military field operations and training for combat crews in a nuclear weapon environment. The estimates of crewmember performance are expressed graphically and tabulated in terms of two critical values: radiation dose (free-in-air), and time following exposure. Performance estimates are provided for each of the 15 different types of crewmembers selected to represent typical short-term (from 0.5 to 1.5 min) battlefield engagement scenarios for a small combat crew (three to four members). The crewmembers selected for study are from the following four groups: (1) field artillery gun crews, (2) field artillery fire direction center (FDC) crews, (3) tank crews, and (4) antitank guided missile (improved TOW vehicle) crews.

The quantitative estimates of degraded performance are based on two bodies of information developed for the Intermediate Dose Program (IDP). The first comes from the comprehensive symptomatology review of human irradiation experience, and the second comes from the U.S. Army combat crew questionnaires. Symptom descriptions quantified in terms of five levels of severity, and the formation of symptom complexes based on the symptomatology investigation, made it possible to obtain performance judgments from the questionnaires administered to army personnel.

Performance data, derived from the army crew supervisors who were asked to judge how typical crewmembers might be able to perform if they had acute radiation symptoms described to them, are correlated with dose and time. Questionnaire responses are evaluated to improve the quality of the data base used for the regression analyses to develop smoothed, expanded, and consistent performance input data used for mapping the dose-time domain provided by a framework of symptom complexes.

Numerical procedures are applied in order to map and generate the three-dimensional performance surfaces and contour plots as a function of dose and time. Since data available from the symptomatology

Investigations are not sufficient to allow uncertainties to be succinctly specified, and the performance levels are developed for particular types of combat crewmembers and scenarios, application of the results obtained is recommended with caution.

PREFACE

This report was prepared as one volume of a set comprising the Pacific-Sierra Research Corporation (PSR) final report for the Defense Nuclear Agency (DNA) under contract DNA001-83-C-0015. The work done under this contract spans a wide range of nuclear weapon effects research covering intermediate-dose radiation, cratering, fire research, analytical models, underground testing, instrumentation, and microwave energy.

This volume reports on material provided for the DNA Intermediate Dose Program (IDP) to assess the effects of nuclear weapon radiation on military troop performance. It also represents one of a series of volumes comprising the DNA IDP report.

Quantitative estimates of combat troop performance are developed, using information and data from other IDP investigations. Along with the IDP Core Group, DNA staff members David L. Auton and Robert W. Young of Science and Technology, Biomedical Effects (STBE) guided this effort. The authors acknowledge the valuable assistance provided by G. Hall, who performed the statistical data analysis and authored Appendix F, "Performance Data Regression Modeling"; and Elizabeth M. Niccum for providing special computer programming assistance in analyzing the questionnaires.

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SECTION 1

INTRODUCTION

This report describes the development of dose/time performance profiles for individual crewmembers exposed to the initial prompt ionizing radiation from a nuclear weapon burst. The individual performance profiles are an integral part of the Defense Nuclear Agency (DNA) Intermediate Dose Program (IDP), whose objective is to estimate the effect of prompt radiation on the battlefield performance of combat crews and units.

Crewmembers representing four different crews were specifically selected for study, because their operations include the prospect of decisive encounters with the enemy. The term "decisive" means that one of the combatant crews will probably be put out of action as a consequence of the encounter. The crews are small, with three or four members, and the encounters are usually brief, typically lasting between 30 and 90 sec. Accordingly, the crew missions, operational scenarios, and members' tasks can be readily modeled. The four crews studied were

- A field artillery gun crew (155 mm self-propelled howitzer).
- A field artillery fire-direction-center (FDC) crew (on manual operation).
- A tank crew (M60A3).
- An antitank guided missile crew in an improved TOW vehicle (ITV).*

The procedural methodology for developing the dose/time individual performance relationships follows from preceding efforts involving IDP program objectives and investigation strategy [Intermediate Dose Program Group, 1983]; a comprehensive review and assessment of acute radiation effects and symptomatology in humans [Baum et al., 1983]; the description and quantification of radiation sickness in terms of five

* Hereafter referred to as simply the TOW crew.

levels of severity, and the aggregation of symptom groups into symptom complexes [Anno and Wilson, 1983]; and the gathering of judgment data on military task performance from questionnaires administered to U.S. Army combat crew personnel [Glickman et al., 1983].

The descriptions of the symptom complexes were used on questionnaires administered to senior noncommissioned officers (NCO) to obtain their estimates on the performance of individual crewmembers. Evaluation of the questionnaire responses is described in Sec. 2. Based on that evaluation, some respondents were excluded as unqualified because they did not meet criteria to ensure that the estimates collected were made by senior NCOs who had recent experience supervising typical crewmembers on current equipment. Other respondents were excluded because they were unresponsive to the questionnaire.

Performance estimates from those respondents found to be reliable were processed through a regression analysis procedure, described in Sec. 3. The regression analysis (1) fits smooth curves to the data, (2) provides a structure for making consistent performance predictions, (3) interpolates and extrapolates the data to make performance estimates for symptom complexes not included in the questionnaire, and (4) provides a means to assess the importance placed on the various symptom complex components as reflected by the data.

The process we use to construct the map of symptom complexes over time for various doses is described in Sec. 4. It maps predictions of individual performance for the symptom complexes, as determined by the regression analysis, on the dose/time plane. Section 5 discusses the following step, which includes selection of the dose, time, and performance mapping points; the output grid structure; the boundary value specifications; and the procedure for generating performance surface and isoperformance contours.

Finally, Sec. 6 presents graphical representations of individual performance profiles for the 15 members of the crews studied. Plots of performance and isoperformance contours versus dose and time are displayed for each crewmember, as well as groups of crewmembers according to similarity of tasks.

Appendixes to this report contain tabular data, graphs, and additional narratives that are related to the technical discussion and materials presented in various sections of the main body of this report. Because of the large quantity and detailed nature of those data, they are not included in the text itself.

SECTION 2

EVALUATION OF PERFORMANCE ESTIMATES

In this section, evaluation of the questionnaires [Glickman et al., 1983] is described. The criteria by which some respondents were excluded before their answers were recorded are defined. Those criteria were rank, time in specialty, and number of crewmembers supervised. Then, the method by which respondents with unresponsive estimates were rejected is outlined. The standards for rejection were the occurrence of any of the following patterns: (1) noncompliance with the instructions; (2) a preponderance of answers at the extremes of the performance range; (3) excessive consistency for many tasks within a symptom complex; or (4) many reversals, where performance under more severe symptoms was better than performance under less severe symptoms.

Table 1 lists the number of questionnaires administered to respondents from each type of crew, and the reasons for eliminating respondents from the sample. Each of the items listed in the table is discussed in the present section. We also discuss how the answers were used to evaluate the structure of the questionnaire itself. After the excluded and rejected respondents were eliminated, the performance estimates from respondents remaining in the sample constituted the data used for the regression analysis (Sec. 3). Appendix A lists all performance time estimates from each accepted respondent.

THE RESPONDENTS

The judgments desired were of soldiers who had directed the activities of many crewmembers, who were familiar with current equipment, and who had recent experience supervising soldiers operating that equipment. We therefore asked that the questionnaires be administered to students attending the Advanced Noncommissioned Officers Classes (ANOC) at the Artillery, Armor, and Infantry schools. The exact groups of respondents requested at the Armor and Infantry schools were obtained, but scheduling difficulties prevented the participation of ANOC students at the

Table 1. Disposition of questionnaires.

	Respondent Specialty				
	Gun Crew	FDC Crew	Tank Crew	TOW Crew	Grand Total
<i>Respondents Polled</i>					
Pilot run	8	4	0	5 ^a	12
Full questionnaire	31	24	44	41	140
Post run	0	9	0	0	9
Total administered	39	37	44	41	161
<i>Respondents Eliminated</i>					
Exclusions ^b					
Grade <E4	0	4	0	0	4
Time in specialty <12 months	0	1	0	0	1
Supervised <5 soldiers	6	7	1	1	15
Self-disqualified	0	0	0	2	2
Missing manuscript	1	0	1	0	2
Subtotal	7	12	2	3	24
Rejections ^c					
Noncompliance	1	0	0	0	1
Estimates at extremes	1	0	2	0	3
Excessive consistency	0	0	1	0	1
Reversals	2	3	1	1	7
Combined causes	3	1	4	1	9
Subtotal	7	4	8	2	21
Total eliminated	14	16	10	5	45
Respondents remaining	25	21	34	36	116

^aNot recorded.

^bBefore analysis.

^cAfter analysis.

Artillery school. Instead, a number of NCOs from the training cadres at Fort Sill answered the artillery questionnaires.

At least 24 acceptable respondents were desired for each type of crew. Since it was not expected that all of the respondents would produce acceptable questionnaires, our initial intention was to obtain

estimates from about 30 qualified respondents of each type. The tank and TOW crew samples each contained more than 40 respondents, and each produced more than 30 acceptable questionnaires.

However, at first an adequate number of respondents for artillery crews was not obtained. We started with 31 gun crew and 24 FDC crew respondents from the training cadres. After eliminating the unacceptable respondents, only 21 from the gun crews and 16 from the FDC crews remained. Because those numbers were low, qualified respondents were added from "lot runs" of the gun and FDC crews and the questionnaire was administered to a second group of 9 FDC crewmembers. Adding questionnaires from those groups increased the total number of acceptable questionnaires to 25 and 21, respectively (see Table 1). Although the number of acceptable FDC questionnaires was lower than that desired, the pattern of responses gives no cause to reject the body of data as unsound. Therefore, the FDC crew data was included in the total of 116 respondents as input for the regression analysis.

THE QUESTIONNAIRE

The questionnaire and the procedures for its administration are described in Glickman et al. [1983]. Briefly, a standard format was used for each crew; every page was identical except for the symptom description at the top of the page (see Fig. 1 for a typical page from the TOW crew questionnaire). Several tasks were listed, together with the usual time for a well crewmember to perform them (Table 2), and the respondent was asked to indicate how long it would take a typical crewmember to perform each task if that crewmember were suffering the symptoms described at the top of that page.

The tasks were divided into two types: about ten tasks were of the type the respondent had been supervising, and six were ordinary tasks

* In order to verify that the questionnaire was understandable to the population from which we intended to draw our sample, we had administered a preliminary version of the questionnaire to several small groups of gun crew and FDC crew supervisors. The questionnaire for this pilot run was almost identical to the final version, with a few differences in language and normal time values, and with six fewer symptom complexes.

DESCRIPTION OF ILLNESS:

415 314

Vomited once or twice; nauseated and may vomit again; exhausted with almost no strength; unsteady upon standing quickly; extremely dry mouth, throat, skin and very painful headache; has difficulty moving; short of breath; burning skin and eyes.

CREW TASKS

Tasks CREWMEMBER	The usual time for each task is about:	How long do you think it would take a crewmember to do each task if he had these symptoms?		
		No increase in time	Amount of time (sec)	Could not do it at all
<u>SQUAD LEADER</u> - Designate azimuth and target	4 sec			
Command driver to firing position	2 sec			
<u>GUNNER</u> - Set supereleva- tion, erect, slew 170° to 10° azimuth	17 sec			
Adjust magnification, acquire targets, iden- tify, arm, & fire.	7 sec			
<u>DRIVER</u> - From standstill, drive forward 40 ft. & stop	20 sec			
<u>LOADER</u> - Reload	60 sec			
Rearrange ready rack	60 sec			

Target Tracking Accuracy

Estimate the chance of staying on target during the last 6 seconds of flight
(usual chance 90%). _____%

ORDINARY TASKS

Climb two flights of stairs briskly	15 sec			
Lift five heavy boxes of books from the floor to a 3 ft high table	20 sec			

- How many flights of stairs could a crewmember climb quickly before becoming breathless? _____ flights
- How long could a crewmember keep walking at a brisk pace before his legs get tired? _____ minutes
- How many heavy boxes could a crewmember keep lifting from the floor to a table before he would have to stop and rest? _____ boxes
- How long would it take a crewmember to open a simple 3-number combination lock? _____ seconds

How much confidence do you have in your estimates?

1 None	2 Not Much	3 Some	4 A Lot	5 Certain
-----------	---------------	-----------	------------	--------------

Figure 1. Sample page from questionnaire (TOW crew).

Table 2. Crew tasks.

Crew Type ^a	Position	Task Number	Crewmember	Description of task	Usual Time (sec)
Gun Crew					
1	1	1	Chief of section	Receive fire order and call quadrant elevation, deflection, projectile, charge, fuze	3
1	2	2	Gunner	Set deflection	7
1	2	3		Traverse tube and level bubble	7
1	3	4	Assistant gunner	Set quadrant elevation	7
1	3	5		Elevate tube and level bubble	3
1	4	6	Loader	Lift projectile to tray	2
1	4	7		Position and operate hydraulic rammer	5b
1	4	8		Place charge and release breech block	2
1	4	9		Insert primer and close firing lock	1.5
1	4	10		Attach lanyard and fire	1.5
1	4	11		Swab tube and inspect bore	3
P/C Crew					
2	1	1	Fire direction officer	Announce fire order	2
2	1	2		Review calculations	5
2	1	3		Announce fire mission	3
2	2	4	Horizontal control operator	Plot target location on chart	5
2	2	5		Orient range-deflection protractor	3
2	2	6		Read range-deflection protractor	3
2	3	7	Computer	Calculate fuze setting, deflection, and quadrant elevation	15
2	3	8		Announce fire commands to guns	3

Table 2. Crew tasks (Concluded).

Tank Crew			
3	1	Tank commander	Issue fire command
3	1		Range the target
3	1		Depress and lay gun for direction
3	1		Issue subsequent fire command
3	2	Gunner	Identify target
3	2		Aim and fire
3	2		Apply fire adjustment and fire
3	3	Loader	Arm
3	3		Load and arm
3	4	Driver	Stop
TOW Crew			
4	1	Squad leader	Designate azimuth and target
4	1		Command driver to firing position
4	2	Gunner	Set superelevation, erect, slew 170 deg to 17 ^c
4	2		10 deg azimuth
4	2		Adjust magnification, acquire targets, identify, arm, and fire
4	3	Driver	From standstill, drive forward 40 ft and stop
4	4	Loader	Reload
4	4		Rearrange ready rack
4	2 ^d	Gunner	Target tracking accuracy (probability of staying on target during last 6 sec of flight)

^aCrew type is indicated by the following numbers: 1, gun crew; 2, FDC crew; 3, tank crew; 4, TOW crew.

^bIncludes 2 sec machine time.

^cIncludes 15 sec machine time.

^dPerformance on this task is measured in terms of accuracy; therefore, usual performance is expressed in terms of probability of staying on target rather than time to perform the task. To emphasize that difference, the question was formatted differently on the questionnaire and presented in a different order from the other gunner tasks (see Fig. 1).

familiar to both military and nonmilitary persons. Four of the ordinary tasks did not have stipulated normal values. For cross-calibration purposes, the questions about ordinary tasks with unstipulated norms were to be included on a questionnaire intended to be administered to a group of persons who had experienced radiation sickness from radiotherapy.

Three categories were provided for answers to the questions with stipulated norms: (1) no increase in time (relative to the usual time), (2) amount of time (if longer than usual time), and (3) could not do it at all. All of the questions about crew tasks, with the single exception of the tracking accuracy question on the TOW crew questionnaire, pertained to the time to perform a task. No account was taken of the possible increase in errors that might accompany the increase in time for a sick crewmember to do a task. Although an increase in errors is to be expected of a sick crewmember, we found that concept difficult for the soldiers to accept, especially when coupled with the fact that they viewed many tasks as either being "completed" or "not completed." Since reliable, consistent estimates could not be obtained from the soldiers on that topic without an extensive introductory discussion, the questions were framed about time only.

Performance

Some crewmember tasks include a fixed time for mechanical equipment to perform some function. In the questionnaire, the tasks were presented with the human and equipment times combined because the soldiers had experienced it that way, and discussed it that way when the questionnaire was being developed. An example is shown in Fig. 1. For the gunner's first task, "Set superelevation, erect, slew 170 deg (17 sec)," the ITV turret takes 15 sec to erect and slew, and it takes the gunner 2 sec to initiate the sequence, so the entire sequence takes 17 sec to complete. Our interest focused on the 2 sec portion for *human* performance. We therefore deducted 15 sec from both the "usual time" and the estimates of "time when sick" when we calculated performance.

When the replies were processed, they could be treated in one of three ways:

1. $t - t_0$: the difference between "time when sick" and "usual time."
2. t/t_0 : the ratio of "time when sick" to "usual time."
3. t_0/t : the ratio of "usual time" to "time when sick."

Treating the responses as t_0/t enables performance to be expressed in the interval extending from 1.0 to 0, where 1.0 represents "usual time" and 0 represents "could not do it." Using t_0/t also accommodates the indefinite boundary between "amount of time" and "could not do it." It was apparent from the soldiers' answers that that boundary differed widely between respondents. Some respondents did not give any answers larger than 30 times the usual time, whereas others gave answers as large as 300 times the usual time. In terms of the t_0/t scale, however, that difference falls between a performance of 0.03 and 0.003, where the distinction is unimportant.

Symptom Complexes

The symptom description at the top of the questionnaire can be represented by a six-digit symptom complex number, such as 415314. Each place in that code corresponds to one of six symptom categories, and the value of each digit indicates the severity level for one of the symptoms. The symptom categories, in the order that they appear in the symptom complex number, are as follows: upper gastrointestinal distress; lower gastrointestinal distress; fatigability and weakness; hypotension; infection, bleeding, and fever; fluid loss and electrolyte imbalance. Thus, the above sample code number (415314) indicates the following: no effect for the second and fifth symptom categories (lower gastrointestinal distress, and infection and bleeding); an effect of severity level 4 for the first symptom category (upper gastrointestinal distress), level 5 for the third symptom category (fatigability and weakness), level 3 for the fourth symptom category (hypotension), and level 4 for the sixth category (fluid loss and electrolyte imbalance).

EXCLUSIONS

The first page of the questionnaire (Fig. 2) was designed to collect demographic information about the respondents. The complete body of demographic data is listed in Appendix B, and summarized in Table 3.

A histogram of the demographic responses is shown in Fig. 3. The vertical dotted line denotes the threshold for exclusion used in Glickman et al. [1983]. The preponderance of respondents for tank and TOW crews cluster toward the high end of all three histograms; "Grade," "Time in specialty," and "Number supervised." Only one respondent for each of those crews (302, 414)* failed to meet the criteria. Respondents for the artillery crews (gun crews and FDC crews), on the other hand, cluster more closely toward the exclusion thresholds. Indeed, 18 of those respondents failed to meet the criteria. That difference suggests that the artillery sample was unlike the tank and TOW crew samples and might perhaps make different judgments.

Any respondent who failed to meet one of the criteria was excluded. Some respondents failed to meet more than one criterion. Four were excluded because their rank indicated insufficient responsibility. Two of those four could also have been excluded on the basis of insufficient time in their specialty. One other respondent was excluded on the basis of both insufficient time in his specialty and insufficient supervisory experience.

In all, 15 respondents reported insufficient supervisory experience. But there was one peculiar aspect of responses to the question about supervisory experience; some respondents with 10 years in their specialty, for example, claimed to have supervised only 10 or 20 crewmembers. Most respondents with that much experience claimed to have supervised more than 50 crewmembers. It may be that some respondents interpreted the

*The respondent numbers are given here to permit readers to examine the demographic data for each excluded respondent, which are listed in Table 3, and to examine the full set of answers from each of the 21 rejected respondents listed in Appendix D. Each respondent is signified by a three-digit code, with the first digit indicating the type of crew they had supervised (see Table 2). Gun crews are designated as 1, FDC crews as 2, tank crews as 3, and TOW crews as 4. The last two digits indicate the order in which the respondents completed the questionnaire.

To help us understand the characteristics of this group we are asking you to supply some information about your military experience. Please note that all your questionnaire responses will be strictly anonymous and there will be no attempt to link these responses to you as an individual. The answers to the information below will be used only for descriptive purposes. Please supply the following information about yourself:

Your present grade and MOS? _____

How long have you been in the Army? _____

How long have you been in anti-armor? _____

Have you been in combat? Yes _____ No _____ When _____

Have you been in anti-armor combat? Yes _____ No _____

When _____

Have you served as a: _____ When? _____ How long? _____

Squad Leader _____

Gunner _____

Loader _____

Driver _____

Approximately how many crewmen have you supervised in Mounted TOWs?

2 5 10 20 50 More than 50

Briefly describe your military duties during the past year:

Figure 2. Sample of demographic data sheet.

Table 3. Demographic summary.

Respondent	Grade	Time (months)	Number Supervised	Respondent	Grade	Time (months)	Number Supervised
101	5	36	5	211	1 ^d	121	5
102 ^a	5	96	5	212	5	42	5
103 ^{a,b}	5	31	5	213	5	48	--
104 ^a	6	120	10	214	6	84	10
105 ^a	5	51	20	215	4	30	5
106 ^a	5	120	5	216	5	54	10
107 ^a	5	60	10	217 ^c	6	102	2 ^c
108 ^a	5	46	5	218	7	192	>50
109 ^a	6	120	10	219 ^{c,e}	4	11 ^e	0 ^c
110	5	72	10	220	5	48	10
111	5	50	20	221	5	12	5
112	5	39	5	222 ^c	5	62	2 ^c
113	5	96	5	223	4	48	5
114	5	48	10	224	4	24	5
115	6	48	10	225	4	25	5
116 ^c	5	42	2 ^c	226 ^c	6	108	0 ^c
117	4	32	--	227	6	60	10
118	6	120	10	228	7	156	<50
119	7	177	10	229 ^f	--	--	--
120	6	96	50	230 ^f	--	--	--
121	5	≈12	10	231 ^{c,g}	4	24	2 ^c
122	5	40	5	232 ^g	4	30	5
123 ^c	5	84	0 ^c	233 ^{d,g,h}	3 ^d	12	-- ^h
124	5	72	5	234 ^{c,g,h}	4	12	0 ^{c,h}
125 ^c	5	48	0 ^c	235 ^g	5	36	5
126	6	24	5	236 ^g	5	48	--
127	5	46	20	237 ^g	4	30	--
128	5	14	5	238 ^g	4	30	10
129 ^c	5	48	0 ^c	239 ^{c,g}	4	30	2 ^c
130	7	156	10	301	6	96	20
131	7	144	>50	302 ^c	6	60	0 ^c
132	5	40	5	303	6	96	>50
133	5	36	5	304	6	84	>50
134	5	30	20	305	6	166	>50
135 ^c	5	30	0 ^c	306	6	108	>50
136 ^c	5	52	0 ^c	307	6	96	10
137	6	84	5	308	7	84	>50
138	5	36	10	309	6	60	>50
139	6	84	10	310	6	96	20
201 ^a	7	72	10	311	6	120	>50
202 ^{a,c,d,e}	3 ^d	9 ^e	0 ^c	312	6	108	20
203 ^{a,c}	4	28	0 ^c	313	6	120	50
204 ^a	4	62	5	314	6	108	>50
205	4	28	5	315	6	102	50
206 ^{c,d,e}	2 ^d	6 ^e	0 ^c	316	6	84	20
207	5	24	5	317	6	96	20
208	4	30	--	318	7	90	>50
209	4	29	5	319	6	108	50
210	6	60	10	320	6	126	>50

Table 3. Demographic summary (Concluded).

Respondent	Grade	Time (months)	Number Supervised	Respondent	Grade	Time (months)	Number Supervised
321	6	133	20	416	7	72	>50
322	7	72	>50	417	6	54	>50
323	6	132	50	418	6	108	>50
324	6	96	>50	419	6	72	>50
325	6	126	>50	420	6	96	50
326 ⁱ	6	78	>50	421	6	84	50
327	6	96	20	422	6	72	50
328	6	72	50	423	6	126	50
329	6	120	>50	424	6	36	>50
330	6	120	20	425	6	132	>50
331	7	174	50	426	6	104	20
332	6	96	>50	427	6	96	50
333	6	138	>50	428	6	96	50
334	6	160	20	429 ^j	7	72	20 ^j
335 ^b	6	101	>50	430	7	60	>50
336	6	126	50	431 ^j	6	36	10 ^j
337	6	132	>50	432	6	60	>50
338	7	135	>50	433	6	84	>50
339	6	120	>50	434	7	72	10
340 ⁱ	7	132	>50	435	6	84	>50
341	6	120	>50	436	6	72	20
342 ⁱ	7	132	>50	437	6	84	>50
343	6	126	50	438	6	84	50
344	6	96	20	439	6	48	20
401	6	60	>50	440	6	54	50
402	6	132	>50	441	6	36	>50
403	6	120	10				
404	6	120	50				
405	6	120	>50				
406	6	108	50				
407	6	68	20				
408	6	72	50				
409	6	48	20				
410	7	204	>50				
411	6	84	20				
412	6	96	>50				
413	6	48	50				
414 ^c	6	36	0 ^c				
415	6	102	50				

NOTE: Respondent numbers consist of a single-digit crew number (see Table 2) and a two-digit number indicating the order in which respondents finished the questionnaires.

^aPilot questionnaire.

^bManuscript missing; respondent excluded.

^c<5 supervised; respondent excluded.

^d<E4; respondent excluded.

^e<12 months; respondent excluded.

^fQuestionnaire not administered.

^gPostrun; symptom complexes in reverse order.

^hDisqualified self--no experience.

ⁱUSMC.

^jNo IVV experience.

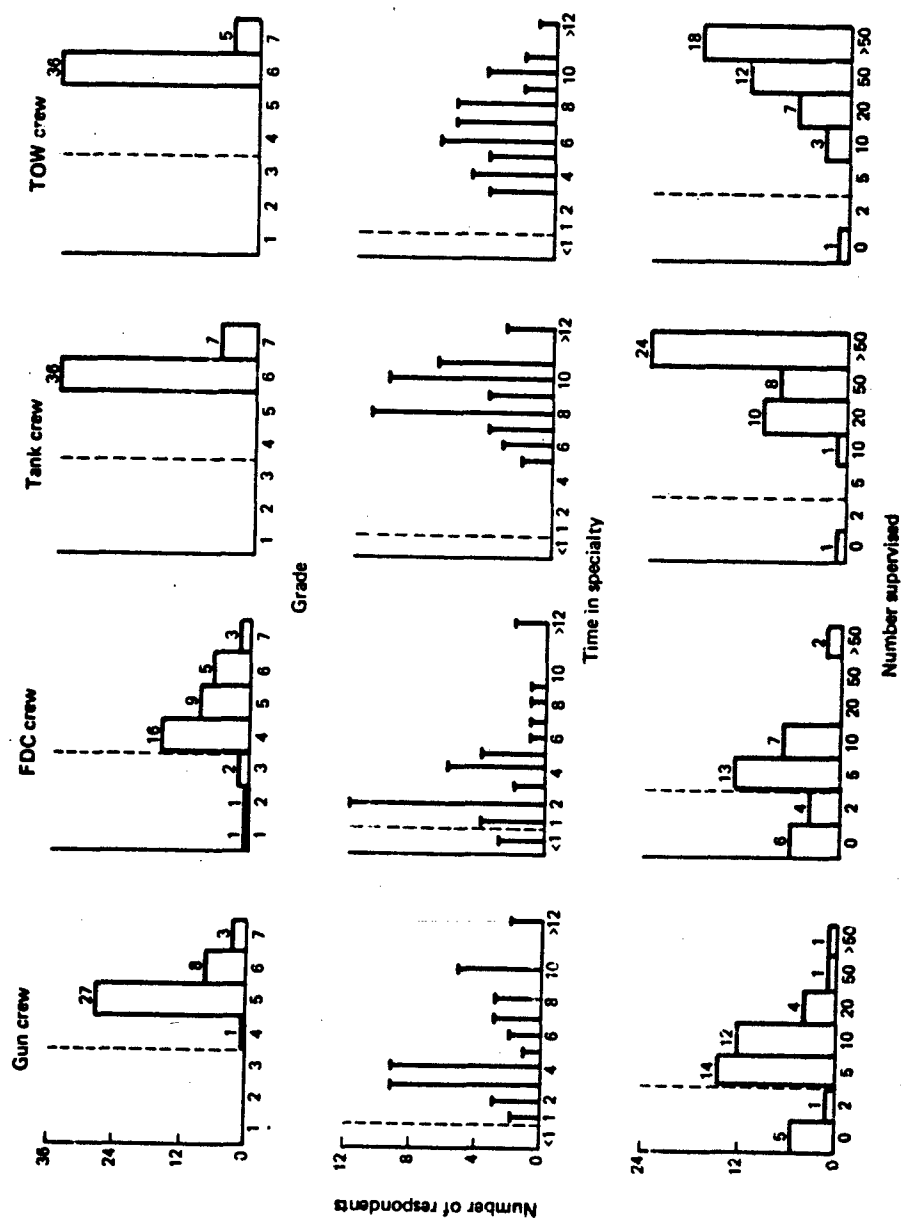


Figure 3. Histograms of demographic responses.

question to be "How many crewmembers have you supervised *at any one time?*" In that case, a tank platoon sergeant would claim 20. And, indeed, the tank crew respondents do show a bimodal distribution, perhaps due to that interpretation of the question. A bimodal distribution of number supervised also appears for the gun crews and FDC crews. That possible misinterpretation did not have any serious consequences for the tank and TOW crew samples, as they lost only one respondent each. However, the gun crew and FDC crew samples lost 6 and 7 respondents, respectively. Those figures represent a loss of 16 and 21 percent of the gun crew and FDC crew samples, as opposed to 3 percent of the tank and TOW crew samples.

Two of the respondents (429, 431) disqualified themselves. They noted on their demographic sheets that, although they had antiarmor experience, they did not feel qualified to make estimates about the TOW crews because they had had no ITV experience.

In two cases, manuscript questionnaires were missing. Responses from one respondent (103) had been transcribed into the data base. But the computer data could not be checked against the manuscript; thus, that respondent was excluded. In the other case (335), no responses had been entered into the computer, so the respondent was excluded.

REJECTIONS

Unlike the excluded respondents, who were eliminated before their answers were recorded, rejected respondents were eliminated on the basis of the answers themselves. The reasons for rejecting those respondents fall into four categories: (1) noncompliance with the instructions, (2) concentration of answers at the extremes, (3) excessive consistency, and (4) reversals. Some respondents were rejected because of a combination of those factors. The rejected respondents' answers are shown in Appendix D.

Noncompliance

One of the respondents (124) did not comply with the instructions to estimate the amount of time for a sick crewmember to perform each task (see Fig. 1). He marked the first sheet of his questionnaire

correctly, but all of the subsequent sheets contained checkmarks in column 2 instead of numerical estimates. Some respondents occasionally entered task times that were less than the usual time. Those entries were recorded as "no reply." In cases where they were numerous, however, they were considered, together with other nonresponsive answers, as one of the combined causes of rejection.

Extremes

Three respondents (113, 301, 304) submitted estimates that were predominantly at either of the two ends of the performance range: "no increase in time," or, "could not do it at all," with very few estimates in the range of degraded performance between the two extremes. That pattern was inconsistent with the pattern of the other respondents, who produced estimates indicating that they expected many of the symptom complexes to cause performance to be partially degraded.

Excessive Consistency

One respondent (303) was found to respond to many symptom complexes with the usual time for each different task multiplied by the same constant, or with the same constant added to the usual time for many different tasks. That respondent was removed from the sample because his estimates apply to the effect of the symptom complex on performance in general, rather than to the effect of the symptom complex on the performance of particular tasks.

Combined Causes

Eight respondents (115, 121, 218, 307, 309, 316, 338, and 403) were found to have many instances of excessive consistency, but not enough to provide conclusive grounds for rejection. When combined with other causes, each also individually insufficient for rejection, excessive consistency and the other combined causes do provide conclusive grounds for rejection. One respondent (403) was rejected for combined causes, plus reversals. Reversals are computed in a way that precludes adding the percentage of their incidence to the percentage of the incidence of other rejection causes.

Reversals

After removal of the extreme and consistent respondents, the estimates were reviewed to identify those instances where performance improved when sickness intensified. A few such instances should be expected for each respondent because (1) time was not provided for the respondents to cross-check their estimates, (2) the format of the questionnaire did not facilitate cross-checking, and (3) the questionnaire did not suggest cross-checking.

For each respondent, performance estimates were compared with tasks where the symptom complex differed in only one symptom, which we called an adjacent symptom complex. For example, a respondent's estimate for symptom complex 312111 would be compared with his estimates for symptom complexes 212111, 412111, 313111, and if no comparison with 313111 was possible, 314111. If the estimated performance for the adjacent symptom complex was the same, it was not counted. If it was different, it was counted as an "opportunity" (to detect a reversal). If the respondent had estimated that the more serious symptom produced higher performance than the less serious symptom, it was counted as a "reversal." The number of reversals was compared with the number of opportunities to obtain the percentage of reversals.

There are no clear cases where the percentage of reversals by a particular respondent approached or exceeded random guessing (50 percent). Six respondents (106, 138, 232, 238, 438) were rejected because the percentage of reversals indicated that their replies were not consistent with the intended graduation of symptom complexes.

QUESTIONABLE SYMPTOM DESCRIPTIONS

The percentage of reversals was also used as an index to judge the clarity of the symptom complex descriptions. That analysis showed that some symptom complexes produced many more reversals than average. A case in point is symptom complex 411111, which should be considered with care in any further analysis. We sought to resolve that and other uncertainties by revisiting the military facilities where the initial questionnaires were administered, and giving follow-up questionnaires to all of the original respondents still available.

To determine if the order of presentation of the symptom complexes had any effect upon the estimates of the respondents, the number of reversals were plotted against order of presentation. The plot, with lines connecting complexes of similar symptom groupings (Fig. 4), shows a pronounced learning curve with three characteristics: (1) the respondents made 10 percent more reversals on the first page of the questionnaire than they made on the worst of the other pages; (2) the respondents made more reversals the first time they encountered a symptom combination than they did on subsequent encounters, and, in general, the more times they encountered a symptom combination the fewer reversals they made; (3) the ability of the respondents to accommodate new symptom combinations appeared to deteriorate with increasing length of questionnaire.

Although the first symptom complex (411111) usually engendered more reversals than other symptom complexes, the difference between that symptom complex and the next worst complex was insufficient to justify deletion of all replies for complex 411111. In their indication of the confidence that they had in their estimates, the respondents did not show an awareness of the learning curve effect.

INTERPRETATION OF SYMPTOM DESCRIPTIONS

In the follow-up questionnaire, the respondents were asked how they interpreted our symptom descriptions. Figure 5 shows the format used to ask that question, and Figs. 6 through 13 are bar graphs of their answers.

The bar graphs indicate that the different groups of respondents sometimes said they interpreted the symptom descriptions quite differently. The less severe upper gastrointestinal distress symptom in Fig. 6a, for example, was correctly interpreted by about 80 percent of the TOW crew respondents so that "vomited once or twice; nauseated and may vomit again" meant that a crewmember did not vomit during the task in question, but only about 20 percent of the tank crew respondents said they gave the description that interpretation. The more severe upper gastrointestinal distress symptom in Fig. 6b was correctly interpreted by only 25 to 30 percent of the respondents. However, the upper gastrointestinal distress question was the first on the follow-up questionnaire, so we suspect that it is likely to have more errors than subsequent questions.

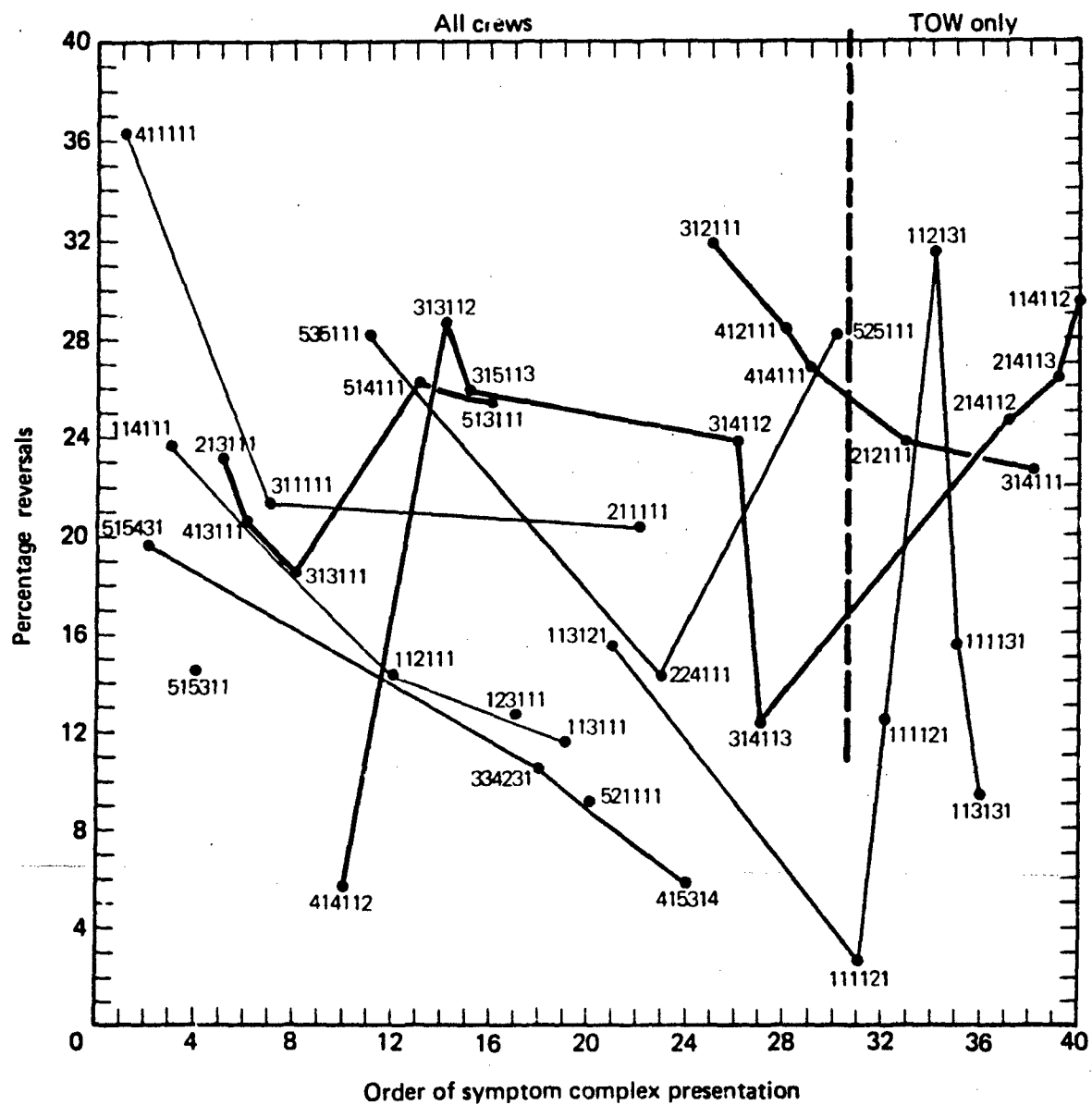


Figure 4. Learning curve.

WHEN WE SAID:	DID THAT MEAN TO YOU: (Check one)	
Vomited once or twice; nauseated and may vomit again	Vomiting occurred during the task	<input type="checkbox"/>
	Vomited before and after but not during the task	<input type="checkbox"/>
Vomited several times, including the dry heaves; severely nauseated and will soon vomit again	Vomiting occurred during the task	<input type="checkbox"/>
	Vomited before and after, but not during the task	<input type="checkbox"/>
Occasional diarrhea, recently defecated and may again	Defecating during the task	<input type="checkbox"/>
	Defecated before and after, but not during the task	<input type="checkbox"/>
Frequent diarrhea and cramps, defecated several times and will again soon	During the task:	
	Defecated	<input type="checkbox"/>
	Had cramps	<input type="checkbox"/>
	Both	<input type="checkbox"/>
	Before and after, but not during the task:	
	Defecated	<input type="checkbox"/>
Had cramps	<input type="checkbox"/>	
Both	<input type="checkbox"/>	
Doesn't want to eat	Must be pretty sick	<input type="checkbox"/>
	Doesn't matter	<input type="checkbox"/>
Difficulty in stopping any bleeding	Bleeding	<input type="checkbox"/>
	Not bleeding	<input type="checkbox"/>
	Doesn't matter	<input type="checkbox"/>

Figure 5. Questions on symptom descriptions.

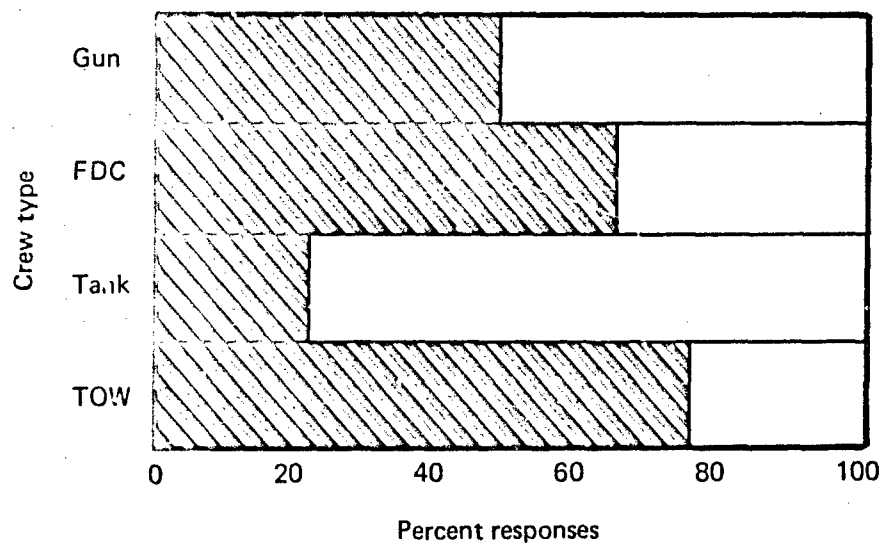
Unsteady upon standing quickly	Loaders are unsteady	
	Loaders are not unsteady	
	Tank commanders are unsteady	
	Tank commanders are not unsteady	
Faints upon standing quickly	Loaders faint	
	Loaders do not faint	
	Tank commanders faint	
	Tank commanders do not faint	
Weak and faint	Faints	
	If careful, can keep from fainting	
	Doesn't faint	
	Only loaders faint	
May faint with moderate exertion	Faints	
	If careful, can keep from fainting	
	Doesn't faint	
	Only loaders faint	
Joints ache	Affects everybody	
	Affects only those who have to move around a lot	
	Affects only those who have to move heavy objects	
	Doesn't matter	

Figure 5. Questions on symptom descriptions (Continued).

Aches all over	Affects everybody	
	Affects only those who have to move around a lot	
	Affects only those who have to move heavy objects	
	Doesn't matter	
Has difficulty moving	Affects everybody	
	Affects only those who have to move around a lot	
	Affects only those who have to move heavy objects	
	Doesn't matter	
Headache	Affects aiming and tracking targets	
	Affects calculating	
	Affects attention and concentration	
	Affects aggressiveness	
	Doesn't matter	
Very painful headache	Affects aiming and tracking targets	
	Affects calculating	
	Affects attention and concentration	
	Affects aggressiveness	
	Doesn't matter	

Figure 5. Questions on symptom descriptions (Concluded).

a. Vomited once or twice



b. Vomited several times

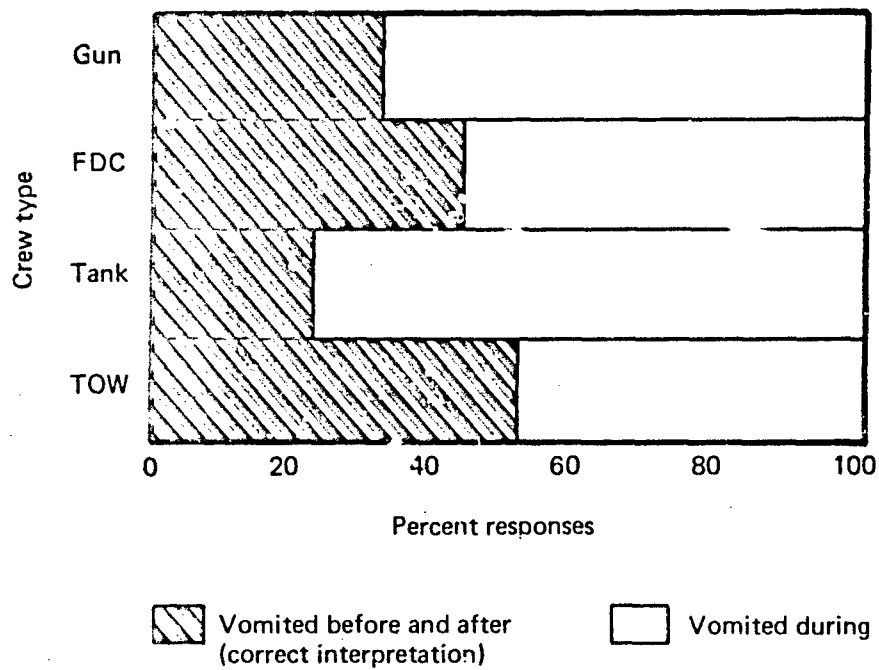


Figure 6. Interpretation of upper gastric symptoms.

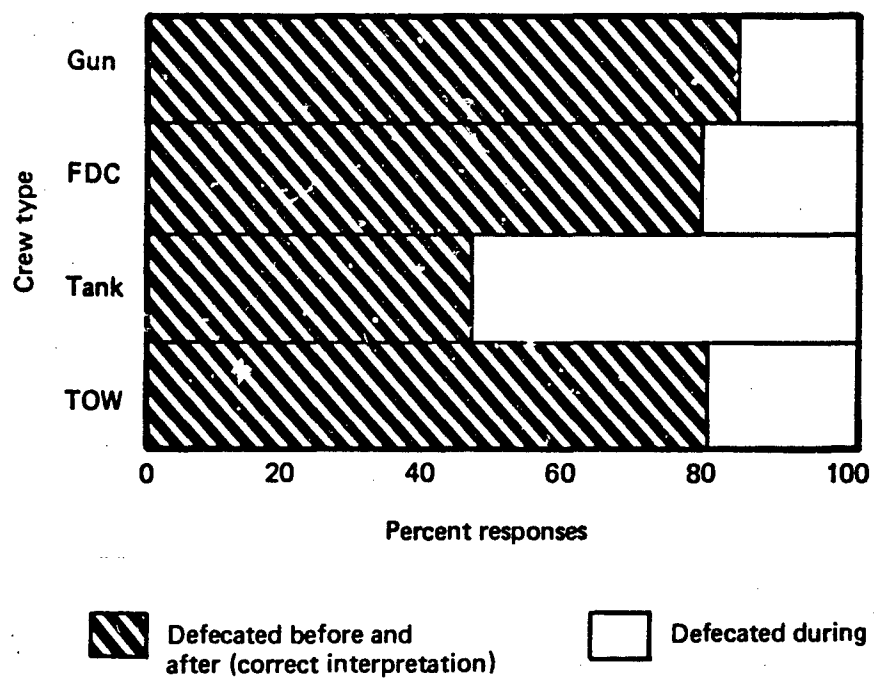
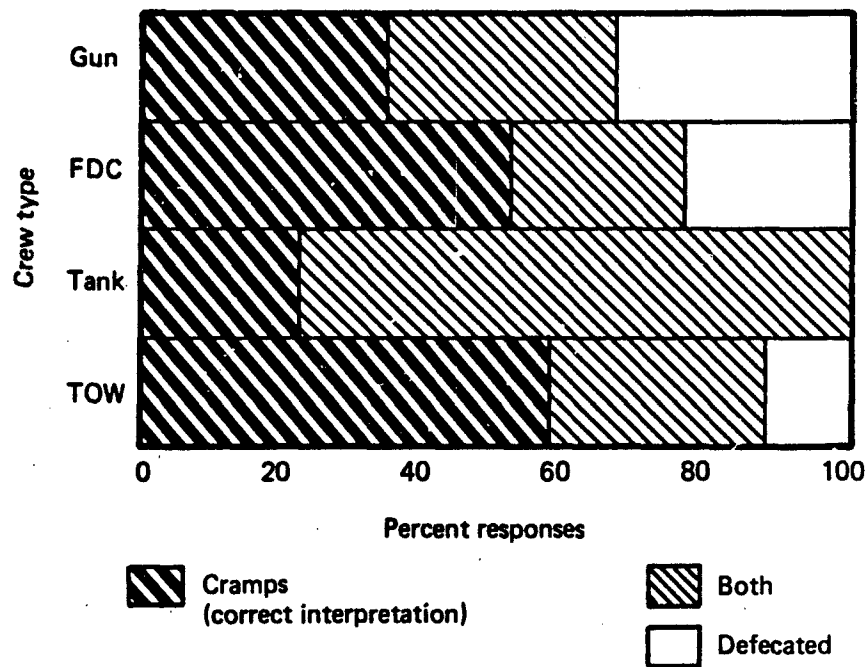


Figure 7. Interpretation of lower gastric symptoms: occasional diarrhea.

a. During the task



b. Before and after, but not during

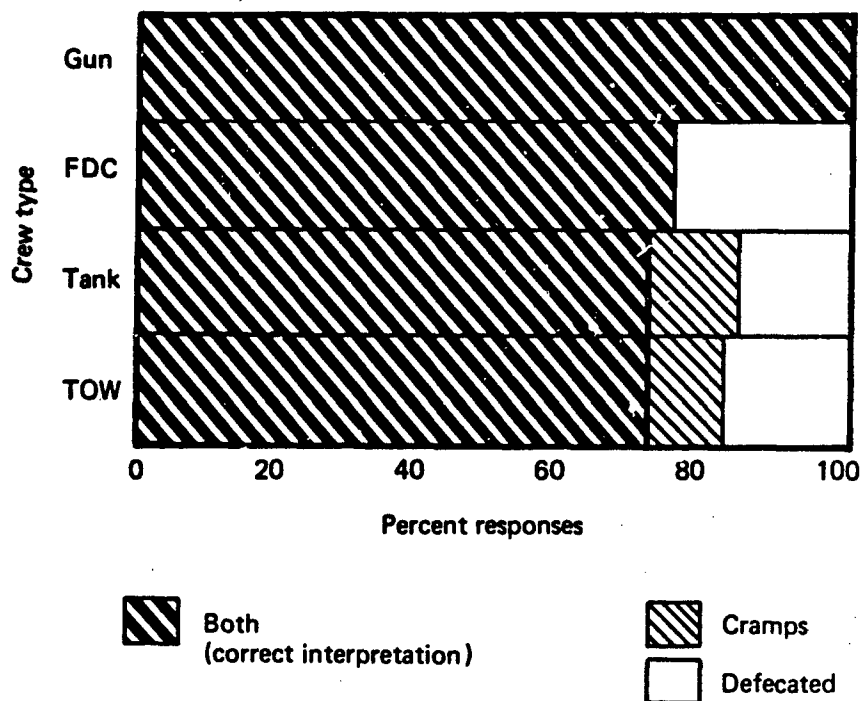
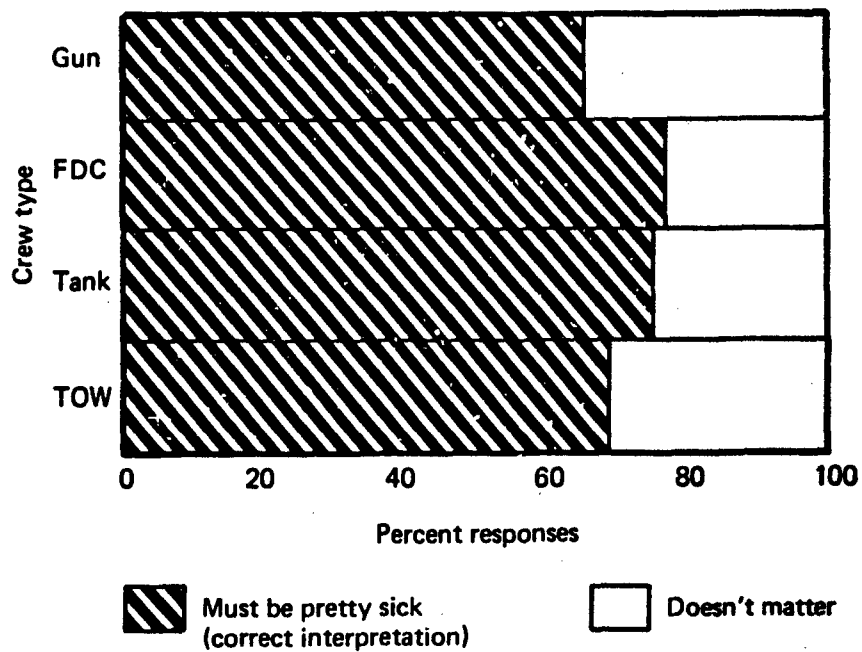


Figure 8. Interpretation of lower gastric symptoms: frequent diarrhea and cramps, defecated several times and will again soon.

a. Doesn't want to eat



b. Difficulty stopping any bleeding

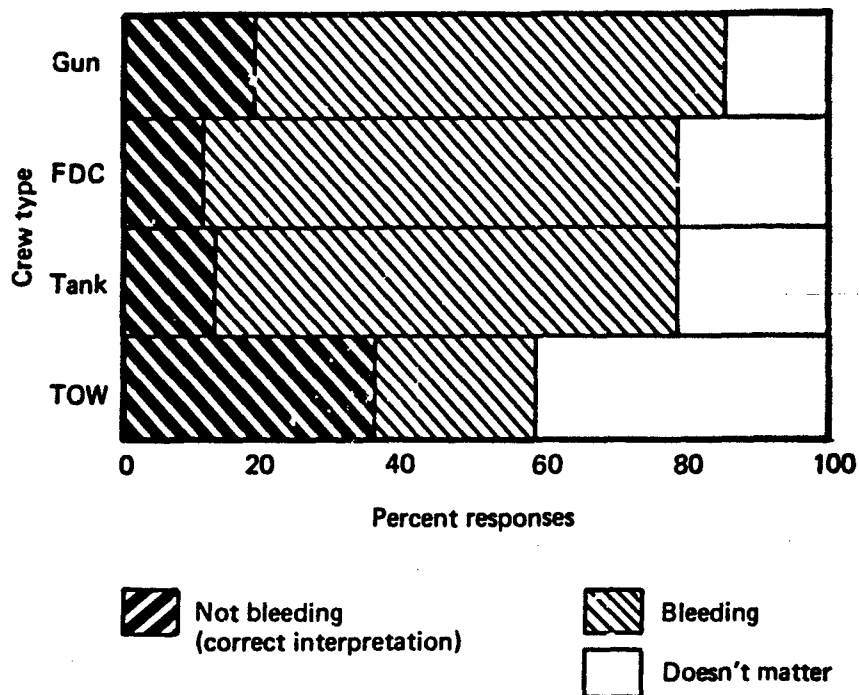


Figure 9. Interpretation of anorexia and bleeding symptoms.

The less severe lower gastrointestinal distress symptom (Fig. 7) was correctly interpreted by about 80 percent of the respondents, for all crews except the tank crew, where about 45 percent of the respondents interpreted the description correctly. The more severe lower gastrointestinal distress symptoms were correctly interpreted by 20 to 60 percent of the respondents for the period during the task (Fig. 8a). On the other hand, for the period before and after the task (Fig. 8b), the symptom was correctly interpreted by 75 to 100 percent of the respondents.

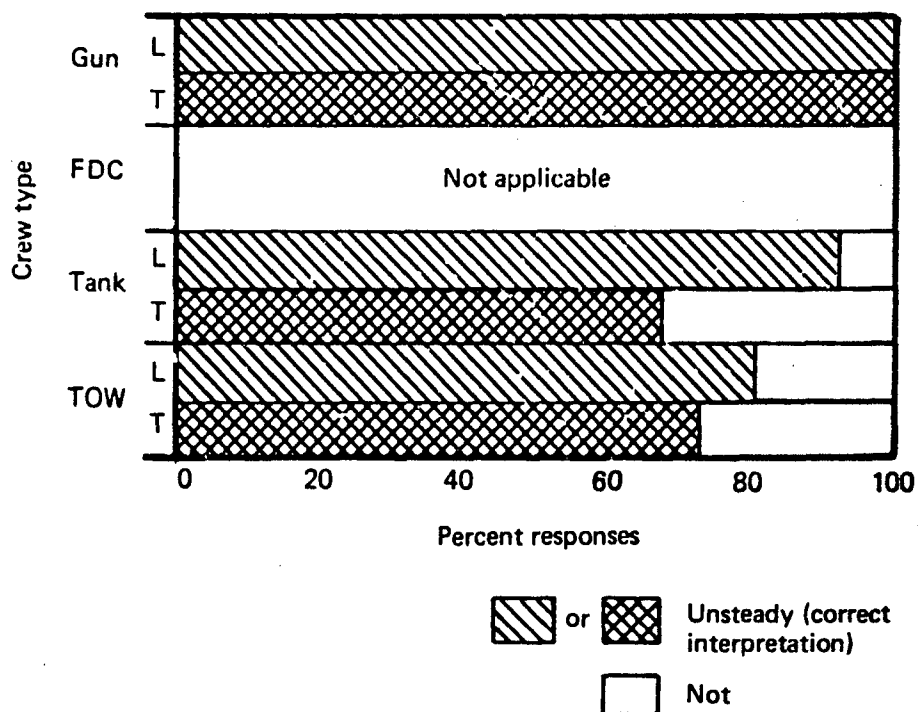
Figure 9 shows that 60 to 75 percent of the respondents interpreted anorexia as we had intended, but only 15 to 35 percent of the respondents correctly interpreted "difficulty in stopping any bleeding."

Correct interpretation of the less severe hypotension symptoms (Figs. 10a and b) varies from about 60 to 100 percent, except for the TOW crew respondents' interpretation of tank commanders (i.e., TOW squad leaders) fainting upon standing quickly (Fig. 10b). Correct interpretation of the more severe hypotension symptoms (Figs. 10c and d) fell between 60 and 85 percent for respondents from all crews.

Between 45 and 85 percent of the respondents correctly interpreted the reduction in loss of mobility that accompanies infections (Fig. 11). The other respondents usually said there would be some effect, but many FDC crew respondents (20 to 40 percent) said that mobility difficulties would not matter. That answer may reflect the sedentary nature of operations within the FDC during those times that the FDC is directing fire rather than moving from place to place.

Unlike the interpretation of the effects of hypotension, which appears to be crew-related, the general effect of headache (Fig. 12) is interpreted by the respondents to affect performance of all crews, but particular effects (Fig. 13) are assessed to apply less to activities that the crew does not perform. For example, the gun crew does aiming but no calculating, and the FDC crew does calculating but no aiming and tracking. Respondents from those crews estimated that there would be a significant (40 to 65 percent) headache effect on the kinds of activities their own crew performed, and little or no headache effect (0 to 2 percent) on the kinds of activities their crew did not perform.

a. Unsteady upon standing quickly



b. Faints upon standing quickly

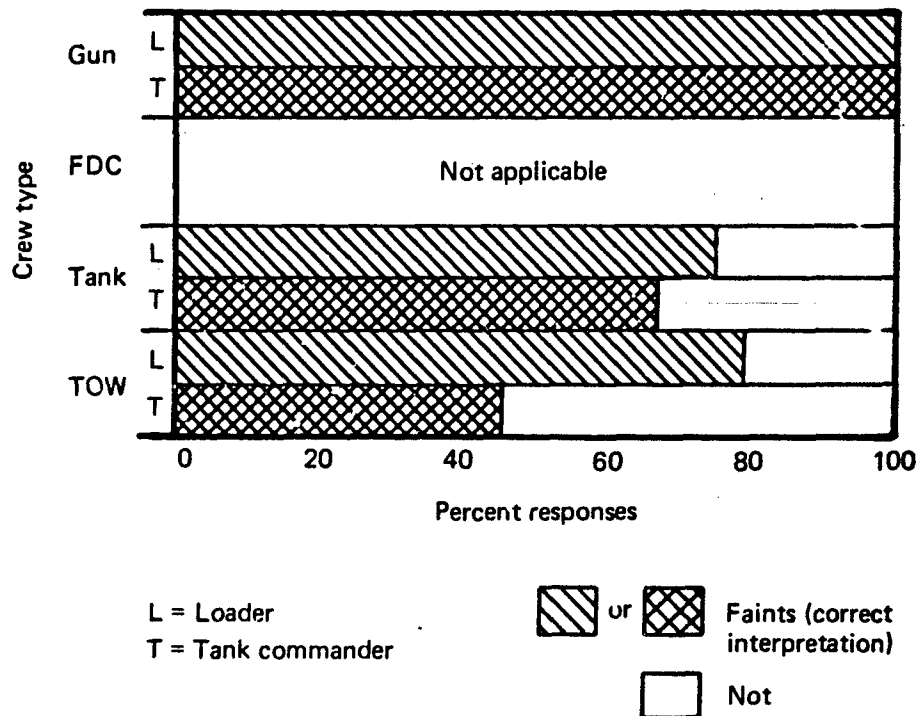
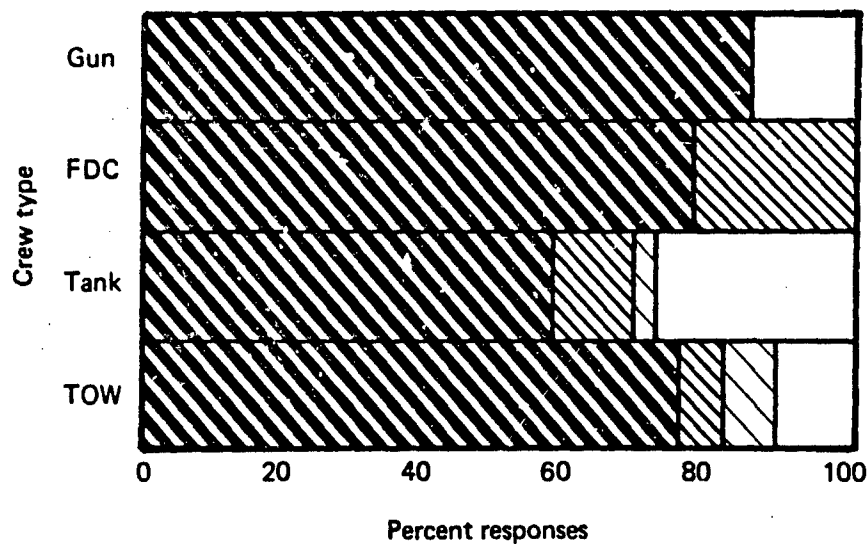


Figure 10. Interpretation of hypotension symptoms.

c. Weak and faint



d. May faint with moderate exertion

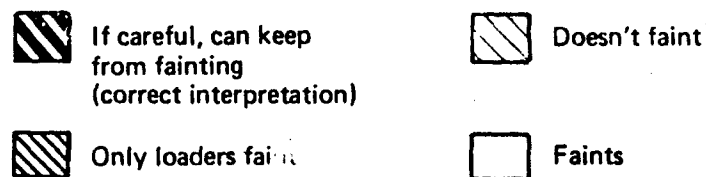
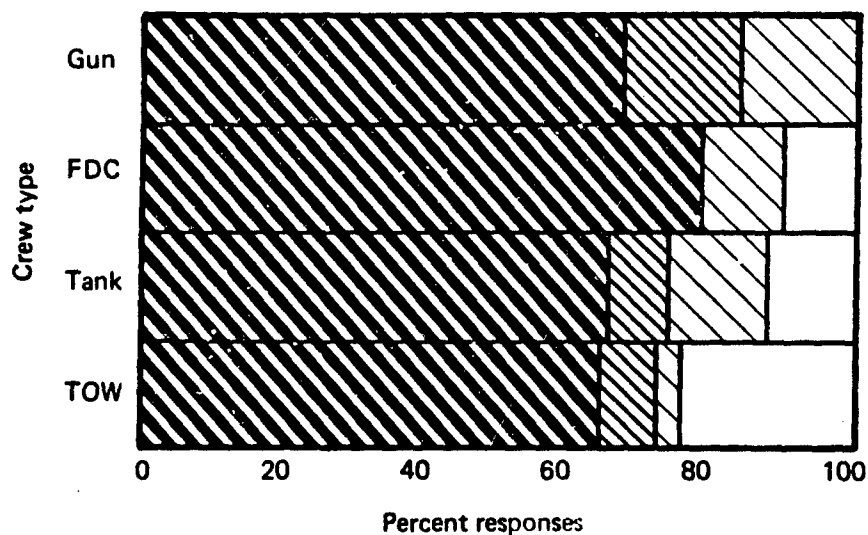
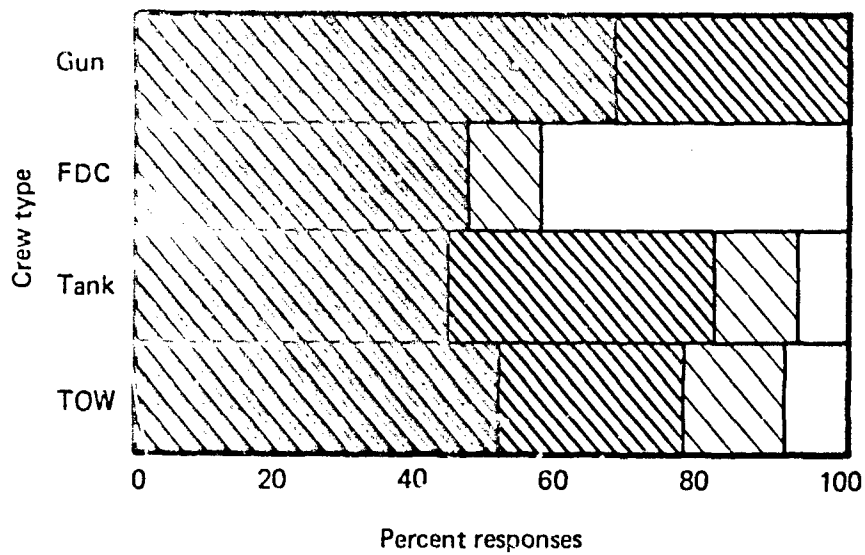


Figure 10. Interpretation of hypotension symptoms (Concluded).

a. Joints ache



b. Aches all over

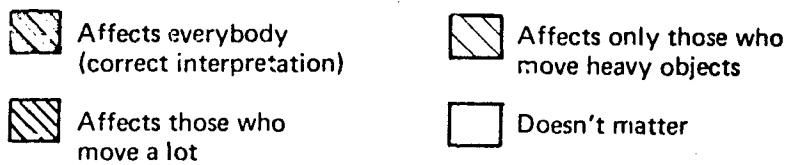
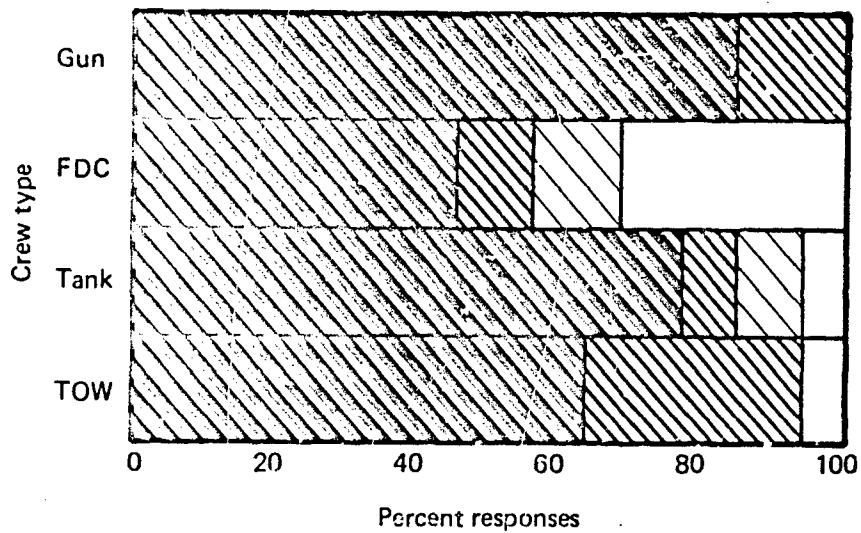


Figure 11. Interpretation of infection symptoms (mobility).

c. Difficulty moving

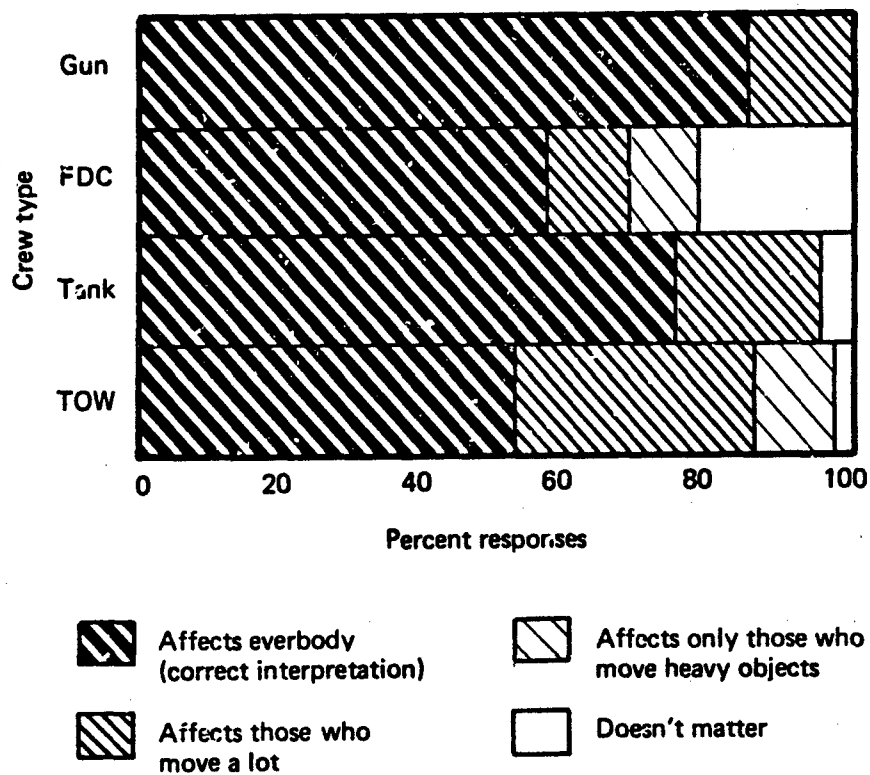
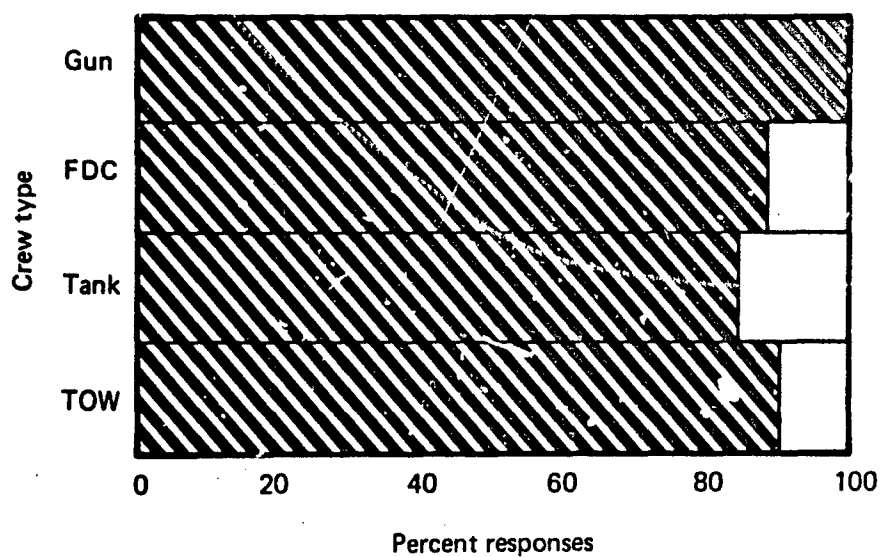
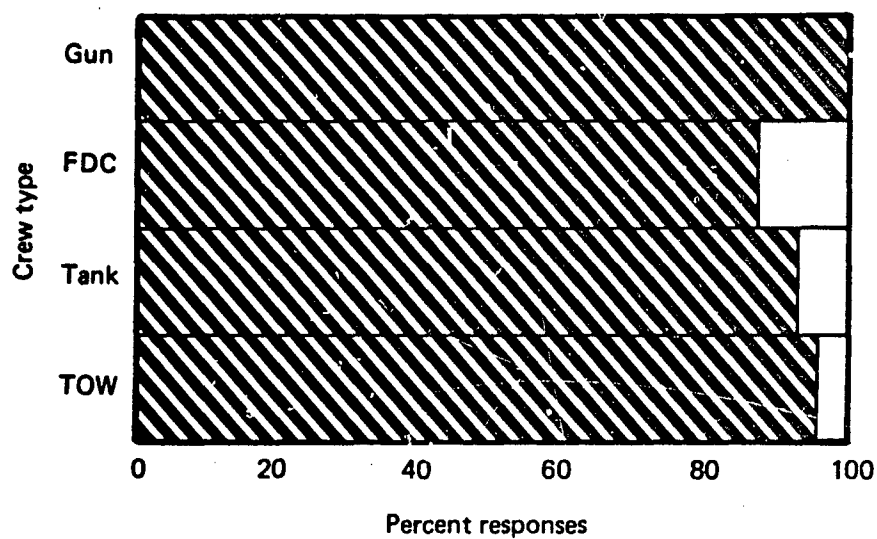


Figure 11. Interpretation of infection symptoms (Concluded).

a. Headache



b. Very painful headache



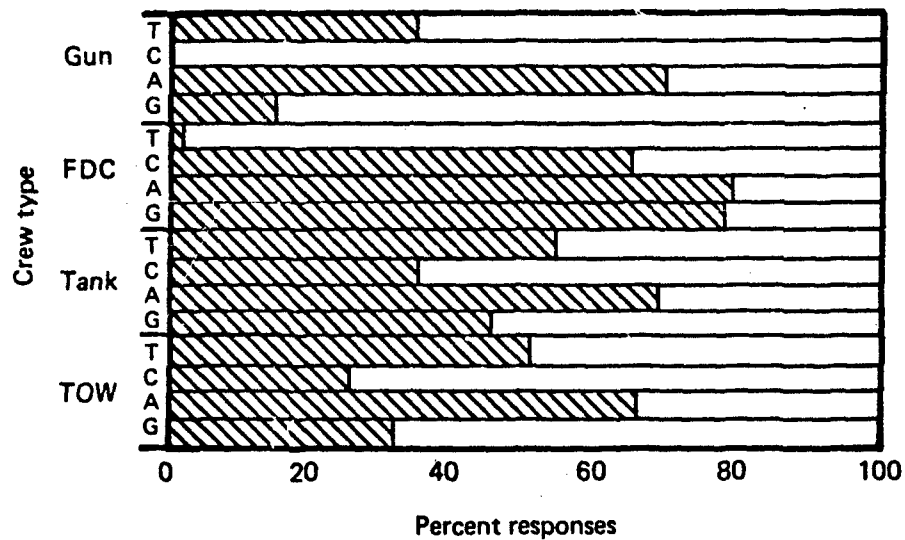
Affects at least one of
indicated activities
(correct interpretation)



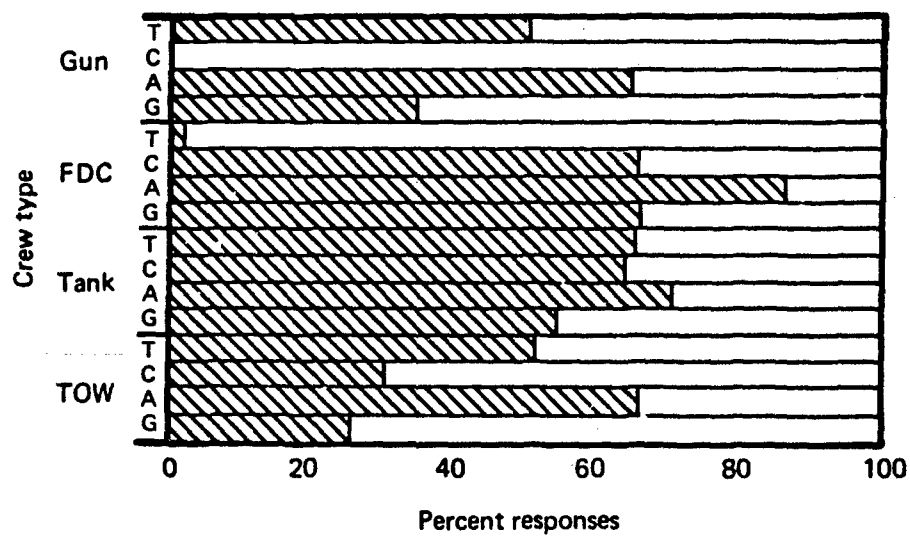
Doesn't matter

Figure 12. Interpretation of headache symptoms.

a. Headache



b. Very painful headache



T = Aiming and tracking
 C = Calculating
 A = Attention and concentration
 G = Aggressiveness



 Affects that category
 Does not affect that category

Figure 13. Activities affected by headache.

Unfortunately, the number of respondents who answered the follow-up questionnaire for the artillery (6 for the gun crew and 10 for the FDC crew) was much smaller than for the tank and TOW crews (27 and 40). Consequently, the follow-up questionnaire does not permit a confident assessment of the effect of symptom interpretations upon the answers of the artillery respondents.

Also, that part of the follow-up questionnaire required the respondents to recall the opinions they had acted upon some 2 months previously when they filled in the questionnaire. It may be that the interpretations were less obvious to the respondents when the symptom descriptions were embedded in the fabric of the questionnaires than they were when explicitly described by the follow-up questionnaire.

TASKS WITH UNSTIPULATED NORMS

Six of the tasks in the original questionnaire were ordinary (non-military) tasks, as opposed to combat crew tasks. The ordinary tasks concerned climbing stairs, walking, carrying boxes, and opening combination locks (see Fig. 1). Four of those ordinary tasks had no "usual" reference times stipulated. In administering the questionnaire to TOW crewmembers, we asked them to stipulate their own estimates of "usual" values for the performance of a typical crewmember when unaffected by sickness. We then compared their estimates for best performance of those ordinary tasks by a sick crewmember with their estimates for performance by a well crewmember. Figure 14 shows how the responses were typically distributed. About one-third of the estimates of best performance when sick were equal to performance when well, which is reasonable. Such a finding indicates that about one-third of the respondents believed that at least one of the symptom complexes would cause no deterioration in normal performance.

Somewhat less than one-half of the respondents estimated that best performance when sick would not exceed performance when well. That too is reasonable. But somewhat more than one-quarter of the respondents estimated that sick performance, for at least one symptom complex, would exceed well performance. A possible explanation is that those respondents did not recall the precise estimate of well performance that they

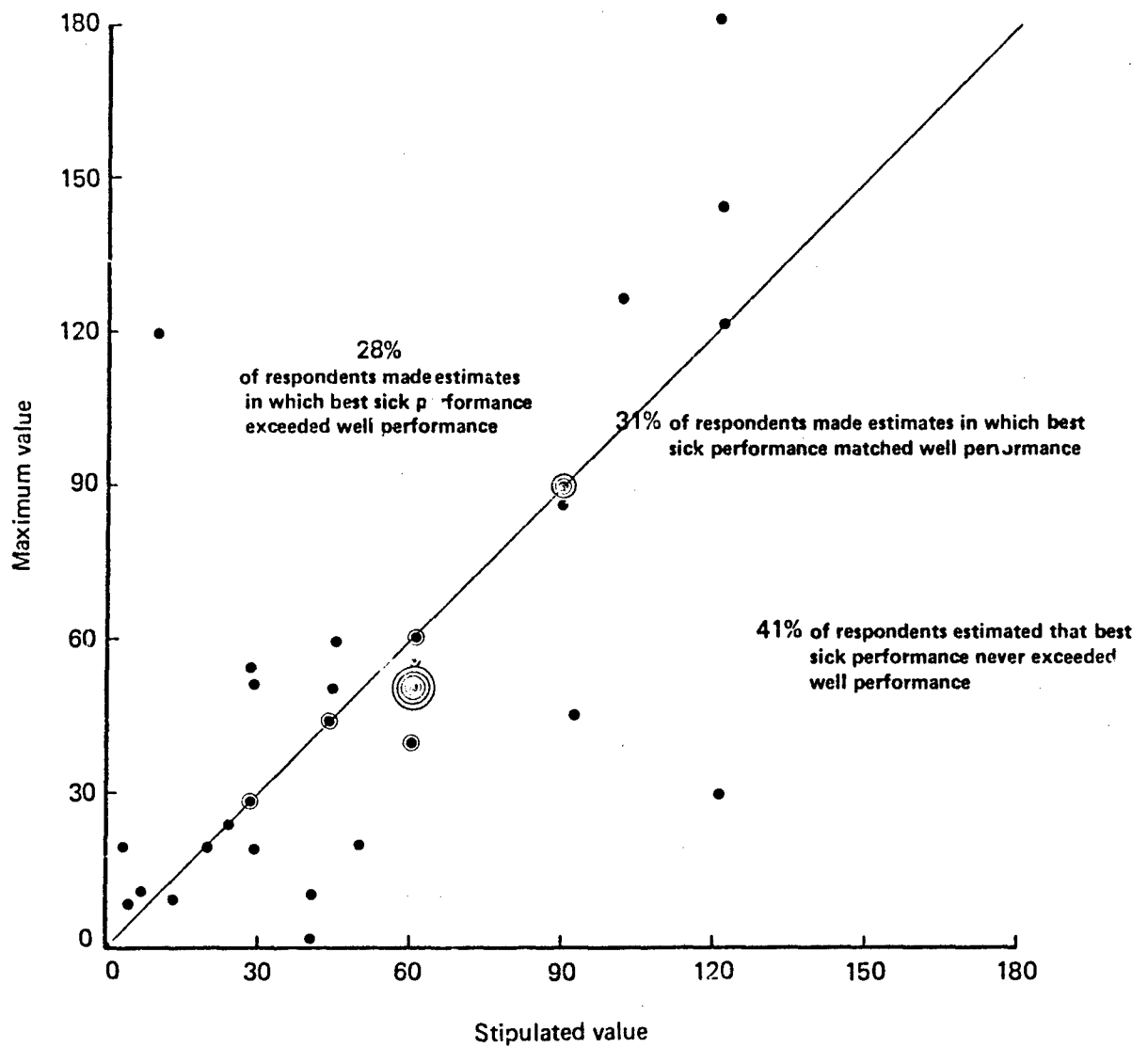


Figure 14. Tasks with unstipulated norms: "How long could a crewmember keep walking . . .?"

specified at the beginning of the questionnaire. Such a lack of recall may have permitted them to make subsequent estimates of sick performance that exceeded their estimates of well performance.

That kind of reversal did not occur in significant numbers for the two ordinary tasks for which the usual times were stipulated on the questionnaire. We thus conclude that: (1) up to 25 percent reversals should be anticipated and be regarded as normal, and (2) the use of questions with unstipulated norms should be avoided.

SINGLE SYMPTOM

The regression analysis of Sec. 3 was intended to fill the gaps in the sequence of symptom complexes because there was not time to ask the soldiers to estimate performance for all of the probable complexes. The estimates that we did obtain from the soldiers can be plotted to show how patterns of performance change with the increase in severity of a single symptom in a complex. This subsection explains that process, and shows that the soldiers estimated that, in most cases, performance declines fairly uniformly as symptom intensity increases, so that a linear regression to fill the gaps between estimates is a reasonable procedure for most of the individual tasks treated here.

The symptom complexes are descriptions of discrete sickness states. Each symptom level is intended to be more severe than the preceding level, but was not intended to be a regular increment along some scale. Also, the scales do not imply that performance at any particular symptom level is necessarily worse than that at the preceding symptom level. It was expected that in some instances performance might remain constant as symptom intensity increased, particularly in cases where the increase in severity occurs in a symptom that does not have a strong influence on the task being plotted. In fact, the soldiers estimated that this would happen in several instances.

Furthermore, it was expected that, in some instances, performance might decline more drastically from one symptom level to the next than for the preceding or following symptom level. And, in fact, the soldiers estimated that this would happen in several instances, as shown in Appendix C. Those plots compare performance estimates for two or three

symptom complexes where symptom severity levels differ in only one symptom, and severity levels for all other symptoms in the complex are held constant. Figure 15 is an example of a single-symptom plot showing the estimated performance of a typical tank crew loader for symptom complexes 411111, 412111, 413111, and 414111. Because the severity level for only one symptom category (fatigability and weakness) changes in this comparison, performance should either decrease or remain the same as the level of fatigability and weakness increases. And it does just that in this case, as in most of the plots in Appendix C. Figure 16, an example of the format used in Appendix C, shows the single-symptom plots for both the tasks performed by the tank crew loader.

VARIANCE

If our description of symptoms was ambiguous, we should expect to see some consistency in the occurrence of wide interquartile ranges for one symptom complex at many tasks. Such consistency occasionally occurs. The most pronounced cases are listed in Table 4. However, there is no occurrence of consistently wide interquartile ranges for all tasks with any of the symptom complexes, so we can conclude that the symptom descriptions do not contain serious ambiguity.

DATA BASE FOR PERFORMANCE ESTIMATES

The performance data base used for the performance regression analyses, described in Sec. 3, is composed of the soldiers' estimates, with the exclusion and rejection of the respondents identified in this section. We believe that the data base represents the aggregate professional estimate of soldiers who are expert in supervising crewmembers performing the tasks described on the questionnaire, and that the most serious of the spurious estimates have been filtered out of the data.

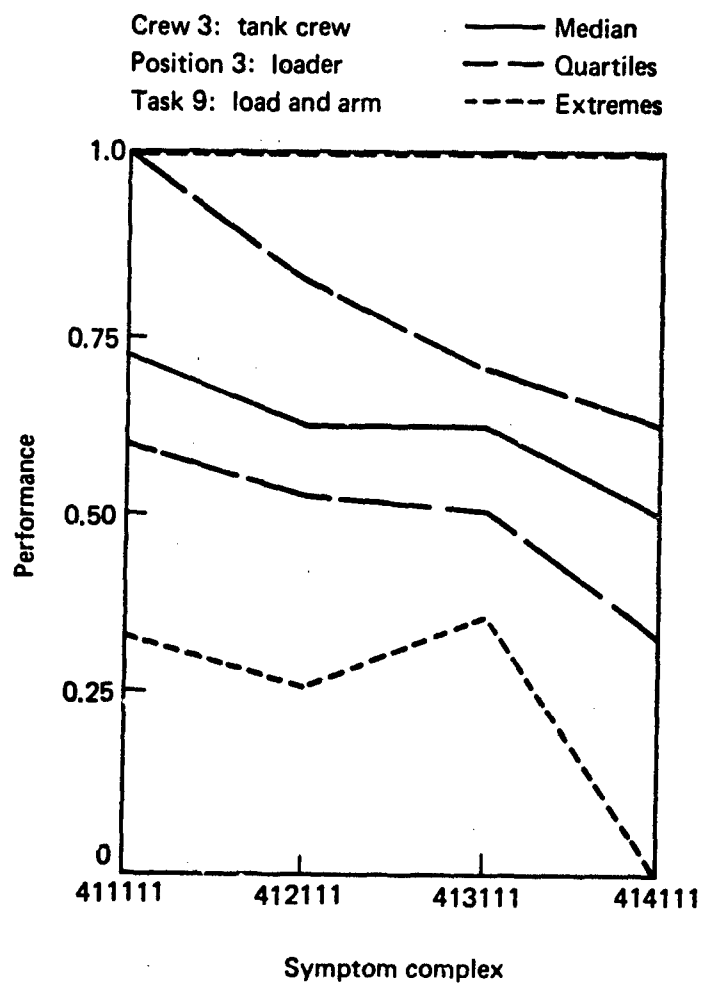


Figure 15. Example of single symptom description.

Figure 16. Example of a series of single symptom plots for all tasks in one crew position.

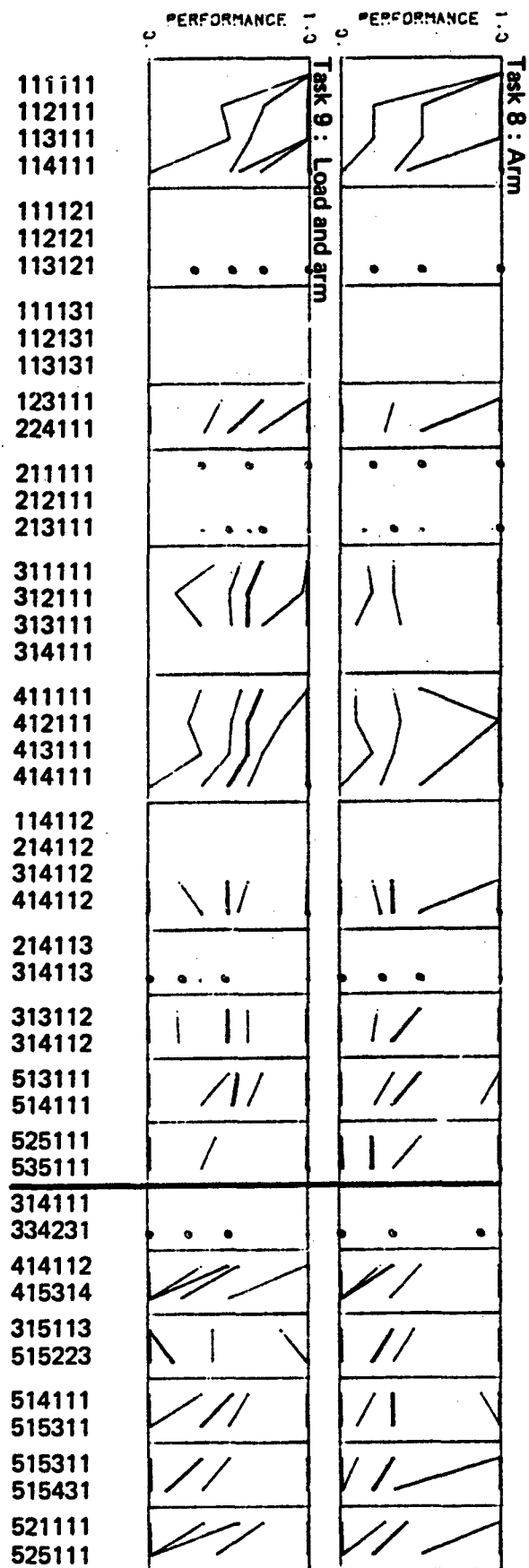


Table 4. Widest interquartile ranges.

Symptom Complex	Crew	Task	Median t_0/t	Interquartile Range
111131	4	3	0.40	0.87
113111	1	6	0.50	0.78
114111	3	1	0.42	0.80
		5	0.42	0.75
114112	4	5	0.57	0.80
123111	1	7	0.50	0.73
		11	0.60	0.70
211111	1	6	0.40	0.80
		9	0.75	0.70
213111	3	1	0.50	0.73
		5	0.50	0.73
214113	4	5	0.50	0.80
224111	1	7	0.60	0.75
	3	1	0.33	0.77
		3	0.46	0.73
		5	0.33	0.84
		8	0.50	0.73
311111	3	5	0.50	0.75
312111	3	1	0.33	0.75
	4	3	0.40	0.80
313111	2	8	0.60	0.70
	4	3	0.40	0.80
313112	3	8	0.50	0.77
314112	3	8	0.33	0.80
314113	1	2	0.48	0.72
		4	0.48	0.70
	3	6	0.52	0.72
		7	0.48	0.74
		10	0.45	0.77
334231	1	2	0.47	0.70
		4	0.47	0.70
	3	6	0.52	0.75
		7	0.46	0.70
		8	0.33	0.88
411111	4	4	0.40	0.80
412111	1	1	0.55	0.70
		10	0.75	0.70
414111	1	7	0.60	0.81
	3	1	0.33	0.80
		5	0.33	0.80
		8	0.50	0.75
414112	4	3	0.50	0.72
513111	1	7	0.60	0.83
		10	0.50	0.77
	3	1	0.33	0.82
		5	0.33	0.80
514111	1	7	0.38	0.77
515311	3	8	0.33	0.90
521111	1	7	0.75	0.71
		8	0.45	0.27
		10	0.75	0.70
	3	5	0.33	0.80
		8	0.42	0.73
	4	3	0.40	0.87
515223	2	3	0.60	0.85
525111	1	2	0.48	0.70
		3	0.47	0.70
		4	0.52	0.72
	3	6	0.40	0.83
		7	0.31	0.70
	4	5	0.51	0.80
535111	3	6	0.40	0.73

SECTION 3

PERFORMANCE REGRESSION ANALYSIS

This section describes the procedure used to develop linear least squares regression models based upon the army questionnaire data discussed in Sec. 2. The models provide the means to (1) fit smooth curves to the original data, (2) generate consistent predictions of performance, (3) interpolate and extrapolate performance for symptom complexes other than those from the questionnaire data, and (4) assess the relative importance of each of the specific symptoms in the complexes.

Since the original data consist of estimates of time required to complete a task, a consistent method of converting those estimates to relative performance values is needed. Additionally, a procedure had to be developed that combines data for several different tasks into a single set of estimates for a given crew position. The regression analysis used here fits selected models to the data. It provides relationships for estimating performance and the associated variances in fitting the data. The performance values that we calculate with the models can then be applied to a dose/time mapping framework (Sec. 4) to yield predictions of overall performance as a function of dose and time.

As discussed in Sec. 2, army personnel were asked to answer questions regarding the length of time it would take crewmembers to perform normal combat tasks if experiencing specific physiological symptoms. Each given combination of those symptoms is referred to as a symptom complex. Questionnaires presented to members of artillery gun crews, artillery FDC crews, and tank crews contained 30 different symptom complex descriptions; the mounted TOW crew questionnaire contained ten additional symptom complex descriptions. Table 5 gives summary information on the structure of the questionnaire data used in the regression analysis. A more detailed summary of task descriptions, reference performance times, and numbering is provided in Table 2.

Regression analysis of the performance data was done with the SAS [Ray et al., 1982] and STATLIB [Brelsford and Relles, 1981] software

Table 5. Combat crew summary for regression analysis.

Combat Crew ^a	Number of Respon- dents	Number of Symptom Complexes	Crew Position ^a	Tasks ^b
1--Artillery, gun	25	30	1--Chief of section	1
			2--Gunner	2, 3
			3--Assistant gunner	4, 5
			4--Loader	6, 7, 8, 9, 10, 11
2--Artillery, fire direc- tion center	21	30	1--Fire direction officer	1, 2, 3
			2--Horizontal control operator	4, 5, 6
			3--Computer	7, 8
3--Armor, tank	34	30	1--Tank commander	1, 2, 3, 4
			2--Gunner	5, 6, 7
			3--Loader	8, 9
			4--Driver	10
4--Antiarmor, mounted TOW	36	40	1--Squad leader	1, 2
			2--Gunner	3, 4
			3--Driver	5
			4--Loader	6, 7

^aNumbers refer to indices used in computer codes.

^bSee Table 8 for task descriptions.

systems. Those software systems provide comprehensive diagnostic options that guide selection of the model appropriate for the questionnaire data. A discussion detailing the regression analysis procedure is given in Appendix F.

INPUT DATA

Since the fundamental response variable obtained from the questionnaires was the estimated time t required to complete a task against a stated reference time t_0 , the basic index chosen as a measure of performance was the ratio of the reference time to the estimated time (t_0/t) to perform a particular task when experiencing acute radiation symptoms. If we make the following index assignments, ignoring any particular

combat crew: i for respondent, j for task, and k for symptom complex, then t_{ijk} , given in Appendix A, represents the performance time estimate provided by the i th respondent for the j th task, given the k th symptom complex; t_{0j} (given in Table 2) is the reference time for performing the j th task. Recalling from the response options provided in the questionnaire (discussed in Sec. 2 above), values for task performance are assigned based on the assumptions shown in Table 6.

Table 6. Performance index.

Questionnaire Response	t_{0j}/t_{ijk}
Could not do it at all (assumes $t_{ijk} = \infty$)	0
Increase in time (i.e., $t_{0j} < t_{ijk} < \infty$)	$0 < (t_{0j}/t_{ijk}) < 1$
No increase in time (assumes $t_{ijk} = t_{0j}$)	1

In performing the regression analysis for tasks, values of the performance measure specified for the dependent variable include averaging over respondents. Averaging the data guarantees that the performance dependent variables for the task and positions lie between zero and one, but are not equal to either one or zero, shown in Appendix E. That condition makes it possible to apply the logit transformation for the dependent variable in modeling the data for the regression analysis. The logit model, which is a logarithmic transformation of the dependent variable, is attractive for application to the fractional type of data we have, since the relationships guarantee that all predicted performance values lie within the interval (0, 1).

For the j th task, the performance measure is the average over N respondents for a particular crew, i.e.,

$$\bar{p}_{jk} = \frac{1}{N} \sum_{i=1}^N \left(\frac{t_{0j}}{t_{ijk}} \right), \quad (1)$$

where, based on the assumptions above, $0 < (t_{0j}/t_{ijk}) < 1$. Values of \bar{p}_{jk} are given in Appendix E, where $0 < \bar{p}_{jk} < 1$.

For a given crew position, where a crewmember may perform more than a single task (see Table 5), the measure of performance is assumed to be the ratio of the sum of reference task performance times to the sum of average estimated times to perform the tasks when experiencing acute radiation symptoms, or

$$\bar{p}_k = \frac{\sum_{j=1}^J t_{0j}}{\sum_{j=1}^J \bar{t}_{jk}}, \quad 0 < \bar{p}_k < 1, \quad (2)$$

where the estimated time to perform the task (with symptoms) is

$$\bar{t}_{jk} = \left(\frac{t_{0j}}{\bar{p}_{jk}} \right), \quad 1 < \bar{t}_{jk} < \infty. \quad (3)$$

The \bar{p}_k values, given in Appendix E, are input for analyzing the relationships that predict individual performance for each crewmember position.

LINEAR REGRESSION MODELING

We limited regression analysis to linear models, assuming that performance can be expressed as some function of a linear combination of the factor (explanatory) variables, i.e., symptom severity levels. The six basic symptom complex variables are designated as follows:

- x_1 = Upper gastrointestinal distress (UG),
- x_2 = Lower gastrointestinal distress (LG),
- x_3 = Fatigability and weakness (FW),
- x_4 = Hypotension (HY),
- x_5 = Infection, bleeding, and fever (IB),
- x_6 = Fluid loss and electrolyte imbalance (FL),

where each x -variable takes on integer values (corresponding to severity level) from 1 to 5. The implicit assumption is made that, given one of the six symptom categories above, severity can be represented in integer multiples. Whether or not that assumption is precisely true was not determined with the linear regression models employed here. It would require complex generalized nonlinear regression analysis, which is beyond the scope of the present effort. Moreover, limitation on the number of symptom complexes allowed in the questionnaires and the selection guidelines followed, based on dose and time considerations, evolved a data set that probably lacks the quantity and type of information required for such an analysis.

Considering only 30 to 40 complexes and possibly a large number of independent parameters p , would place a severe limitation on the number of degrees of freedom available (30 to 40 minus p). More balance in the data is also required, and entails expanding the variety of severity levels across symptom complexes. The symptom complexes selected for the combat crew questionnaires and the data that the present analysis is based on, favors the UG, LG, and FW symptom categories where severity level integers that are greater than one appear more frequently than HY, IB, and to a lesser extent, FL.

In addition to the data limitations and additional complexity required, we did not employ nonlinear regression modeling because we judged that the data could be reasonably represented by a linear model. That model may be expressed as follows.

If performance measure is designated by P_k , which corresponds to the k th symptom complex, e.g., for either crewmember position \bar{P}_k or task \bar{P}_{jk} , the linear regression model can be expressed as

$$P_k = \tilde{x}_k' \beta + \epsilon_k, \quad 1 \leq k \leq K, \quad (4)$$

where $\tilde{x}_k' = (1, x_{k1}, x_{k2}, \dots, x_{k6})$ is a vector of integers ($1 \leq x_{kl} \leq 5$) denoting symptom severity level for the k th symptom complex and l th symptom category. The weight $\beta' = (\beta_0, \beta_1, \dots, \beta_6)$ is a vector of regression coefficients β_l that are estimated. Both \tilde{x}_k' and β' (transpose of β) each contain seven ($p = 7$) components corresponding to the six symptom categories discussed above plus the intercept. If additional parameters are to be estimated such as may be required for quadratic models that include squared (x_{kl}^2) and cross-product ($x_{km}x_{kn}$) terms, then the vector lengths may be larger than seven.

Linear quadratic model forms were applied to the data to investigate how well a prediction relationship, including squared and cross-product terms, could represent the data. Based on that analysis (discussed in Appendix F, "Transforming Factor Variables"), we concluded that a quadratic form cannot be developed to model the data for predicting individual performance. The main problem uncovered from the regression diagnostics was multicollinearity (i.e., linear combinations formed by the independent variables). Certain quadratic and cross-product terms form linear combinations with the original six symptom categories, resulting in a noninvertible ($X'X$) matrix. That difficulty arises primarily from the lack of balance in the data set mentioned above.

In linear regression modeling, a usual assumption is that the error terms $\epsilon_k = P_k - \tilde{x}_k' \beta$ (actual values minus conditional mean values) are independent, have a common variance, and are normally distributed with a mean equal to zero, i.e., $\text{var}(\epsilon_k) = \sigma^2$. The present regression analysis generally indicated the residuals to be normally distributed.

Writing the linear regression model in matrix notation, we have

$$Y = X\beta + \epsilon, \quad (5)$$

where

$$X = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_k \end{bmatrix} = \begin{bmatrix} 1, x_{11}, x_{12}, \dots, x_{16} \\ 1, x_{21}, x_{22}, \dots, x_{26} \\ \vdots \\ 1, x_{k1}, x_{k2}, \dots, x_{k6} \end{bmatrix},$$

$$Y = \begin{bmatrix} p_1 \\ p_2 \\ \vdots \\ p_k \end{bmatrix}, \quad \beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_6 \end{bmatrix}, \quad \epsilon = \begin{bmatrix} \epsilon_1 \\ \epsilon_2 \\ \vdots \\ \epsilon_k \end{bmatrix}.$$

The β -parameter estimates are given by

$$\hat{\beta} = (X'X)^{-1}X'Y, \quad (6)$$

and the covariance of β is given by

$$\text{cov } \hat{\beta} = \hat{\sigma}^2(X'X)^{-1}, \quad (7)$$

where the estimate of the variance of the errors (or mean square error of residuals) for p parameters is

$$\hat{\sigma}^2 = \frac{(Y - X\hat{\beta})'(Y - X\hat{\beta})}{K - p} \quad (8)$$

CONFIDENCE BOUNDS

Two types of confidence bounds can be constructed about the regression line for predicted performance values (Appendix F, "General Linear Model"). One is based on the variance $\hat{\sigma}_m^2$ of the expected value of performance for any given symptom complex \tilde{x}_k , which reflects the uncertainty in the β -parameter estimates; $\hat{\sigma}_m^2$ is often referred to as the variance of the predicted value of the conditional mean. Another is based on the

variance $\hat{\sigma}_0^2$ of the input performance data relative to the expected values of performance, i.e., relative to the regression line. Often, $\hat{\sigma}_0^2$ is referred to as the variance of the predicted value of a further observed value, i.e., additional performance input data.

Upper and lower 95 percent confidence bounds for the expected performance values predicted by the regression relationships are given as

$$L_{95,m} = \mathbf{x}_k' \hat{\beta} \pm 2.08 \hat{\sigma}_m \quad (9)$$

where 2.08 is the 95 percent cutoff of the t-distribution for a sample size of 30 or 40 (i.e., the number of symptom complexes used in the analysis). The quantities \mathbf{x}_k' and \mathbf{x}_k are row and column vectors, respectively, each containing unity for the first element followed by six integer values (x_1, x_2, \dots, x_6) designating symptom severity levels for a k th symptom complex.

The prediction of a further observation for a given symptom complex \mathbf{x}_k' would also have a value of $\mathbf{x}_k' \hat{\beta}$. However, the variance is

$$\hat{\sigma}_0^2 = \hat{\sigma}_m^2 + \hat{\sigma}^2 \quad (10)$$

$$= \hat{\sigma}^2 [1 + \mathbf{x}_k' (\mathbf{X}'\mathbf{X})^{-1} \mathbf{x}_k] .$$

Upper and lower 95 percent confidence bounds for a further observed value are

$$L_{95,0} = \mathbf{x}_k' \hat{\beta} \pm 2.08 \hat{\sigma}_0^2 \quad (11)$$

The $L_{95,0}$ confidence bounds will be wider than the $L_{95,m}$ confidence bounds and should contain about 95 percent of the observed values (input data) whereas a smaller percentage of the observed values will be included within the $L_{95,m}$ bounds.

CORRELATION OF RESPONSES

Estimates of the effects of correlation between responses from the questionnaire data were made using STATLIB [Brelsford and Relles, 1981]. Analysis of the data (discussed in Appendix F, "Correlation among Model Error Terms") showed significant positive correlation with estimated correlation coefficients ranging from $\rho = 0.2$ to 0.4 . The correlation coefficient ρ is a measure of individual response bias of the respondents. So, for example, with 35 individuals, each providing judgments of performance on a common set of 30 different symptom complex descriptions, some will offer consistently low values, some consistently high values, and others somewhere in between. On the other hand, purely independent responses would result in a zero correlation ($\rho = 0$).

It can be shown theoretically that least squares linear regression yields β -parameter estimates ($\hat{\beta}$) that are unbiased. Therefore, ordinary least squares regression analysis is suitable for estimating β . However, when $\rho \neq 0$, estimates of the variance σ^2 are biased downward (see Appendix F, "Correlation among Model Error Terms"). Because of the strong assumption of normality for the joint distribution of 30 error terms (i.e., jointly correlated with one another) required by STATLIB, it was not possible to precisely determine the extent of the downward bias with the *generalized* least squares regression model package. That package was not designed to give robust estimates of σ for the expanded data set (i.e., when not averaged over individual respondents) from the questionnaires. Furthermore, we are unaware of any existing package designed to develop reliable estimates of σ for the kind of data set developed from the questionnaires. However, from theoretical considerations an inflation factor can be developed to estimate an adjustment from the upper and lower confidence limits. Since it can be shown that σ , as determined by ordinary least squares regression (which assumes $\rho \neq 0$), has a downward bias by a factor of $\sqrt{1 - \rho}$, multiplication of $\hat{\sigma}$ by $1/\sqrt{1 - \rho}$ corrects the bias when $\rho \neq 0$. Since we estimated values ranging from $\rho = 0.2$ to 0.4 , a factor of from 1.12 to 1.29 can be used to increase the upper and lower confidence limits,

$$L_{95,m}(\text{adjusted}) = \tilde{x}_k' \hat{\beta} \pm \left(\frac{1}{\sqrt{1-\rho}} \right) 2.08 \hat{\sigma}_m ,$$

$$L_{95,0}(\text{adjusted}) = \tilde{x}_k' \hat{\beta} \pm \left(\frac{1}{\sqrt{1-\rho}} \right) 2.08 \hat{\sigma}_0 .$$
(12)

The magnitude of such an adjustment is not large; it extends the upper and lower bounds by about 12 to 30 percent.

INDIVIDUAL PERFORMANCE PREDICTIONS

Predictions of individual performance were made using the logit form of the linear regression model. Preliminary analyses were performed on the data using two alternative forms of the linear regression model, and with seven first power terms (intercept plus six symptom categories) for the independent variables (\tilde{x}_k'). The analyses indicated no significant difference between the two forms in fitting the data, one where the logit transformation, $\ln [P/(1-P)]$ is made on the dependent variable (performance), and the other where it is not made. However, predictions of performance using the logit form guarantee that all predicted performance values including the upper and lower confidence limits lie within the interval (0, 1), which is consistent with the input data set. Predictions using the form where the dependent variable is not transformed can yield values outside that interval. Accordingly, the logit form was applied to the data for the regression analysis.

Making the logit transformation of the dependent variable P_k (performance response) gives the form

$$\ln \frac{P_k}{1-P_k} = \tilde{x}_k' \beta + \epsilon_k , \quad 1 \leq k \leq K ,$$
(13)

where $\ln [P_k/(1-P_k)]$ was regressed on the \tilde{x}_k' variables to obtain estimates $\hat{\beta}$ of the β -parameters. Using the data given in Appendix E, regression parameters were obtained for crewmember positions given in Tables 7 through 10 for the gun, FDC, tank, and TOW crews, respectively. The

Table 7. Gun crew regression parameters.

SYMPTOM	CHIEF OF SECTION			GUNNER		
	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	2.808356	0.257279	10.916	3.292434	0.216134	15.233
UPPER GASTRO	-0.225827	0.049776	-4.537	-0.146315	0.041816	-3.499
LOWER GASTRO	-0.365274	0.125597	-2.908	-0.361714	0.105511	-3.428
FATIGUE/WEAK	-0.181312	0.062324	-2.909	-0.244968	0.052357	-4.679
HYPOTENSION	-0.066167	0.129619	-0.510	-0.173207	0.108890	-1.591
INFECT/BLEED	-0.352418	0.158464	-2.224	-0.179993	0.133122	-1.352
FLUID LOSS	-0.434346	0.092686	-4.686	-0.439715	0.077863	-5.647
R SQUARED = 0.8715						
RMS ERROR = 0.339175						
NGF = 23						
R SQUARED = 0.9080						
RMS ERROR = 0.284933						
UGF = 27						

SYMPTOM	ASSISTANT GUNNER			LOADER		
	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	3.113833	0.190724	16.326	2.518392	0.147253	17.103
UPPER GASTRO	-0.134983	0.036900	-3.658	-0.146718	0.028489	-5.150
LOWER GASTRO	-0.366702	0.093107	-3.939	-0.293360	0.071885	-4.081
FATIGUE/WEAK	-0.256687	0.046202	-5.556	-0.300109	0.035671	-8.413
HYPOTENSION	-0.130065	0.096088	-1.354	-0.195549	0.074187	-2.636
INFECT/BLEED	-0.215799	0.117471	-1.837	-0.235970	0.090697	-2.602
FLUID LOSS	-0.435395	0.068709	-6.337	-0.439888	0.053049	-8.292
R SQUARED = 0.9254						
RMS ERROR = 0.251434						
NGF = 23						
R SQUARED = 0.9623						
RMS ERROR = 0.194126						
UGF = 27						

Table 8. FDC crew regression parameters.

SYMPTOM	FIRE DIRECTION OFFICER			HORIZONTAL CONTROL OPERATOR		
	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	3.442455	0.346776	9.927	2.461669	0.191858	12.831
UPPER GASTRO	-0.229368	0.067091	-3.419	-0.189613	0.037119	-5.108
LOWER GASTRO	-0.524898	0.169288	-3.101	-0.344844	0.093660	-3.682
FATIGUE/WEAK	-0.069726	0.084004	-0.830	-0.097654	0.046476	-2.101
HYPOTENSION	-0.168636	0.174709	-0.965	-0.134423	0.096659	-1.391
INFECT/BLEED	-0.240984	0.213588	-1.128	-0.097338	0.118170	-0.824
FLUID LOSS	-0.484706	0.124928	-3.880	-0.320908	0.069118	-4.643
R SQUARED = 0.7757						
RMS ERROR = 0.457161						
DGF = 23						
R SQUARED = 0.8697						
RMS ERROR = 0.252929						
DGF = 23						

SYMPTOM	COMPUTER		
	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	2.875132	0.189877	15.142
UPPER GASTRO	-0.162319	0.036736	-4.419
LOWER GASTRO	-0.422774	0.092693	-4.561
FATIGUE/WEAK	-0.073737	0.045997	-1.603
HYPOTENSION	-0.214650	0.095662	-2.244
INFECT/BLEED	-0.052900	0.116950	-0.452
FLUID LOSS	-0.352097	0.068404	-5.147
R SQUARED = 0.8757			
RMS ERROR = 0.250318			
DGF = 23			

Table 9. Tank crew regression parameters.

SYMPTOM	TANK COMMANDER			GUNNER		
	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	3.739408	0.252659	14.800	4.150500	0.240619	17.249
UPPER GASTRO	-0.304504	0.048882	-6.229	-0.307994	0.046553	-6.616
LOWER GASTRO	-0.499096	0.123342	-4.046	-0.583071	0.117464	-4.964
FATIGUE/WEAK	-0.237838	0.061205	-3.886	-0.183404	0.058288	-3.146
HYPO TENSION	-0.179232	0.127292	-1.408	-0.212194	0.121226	-1.750
INFECT/BLEED	-0.043841	0.155619	-0.282	0.032174	0.148203	0.217
FLUID LOSS	-0.476924	0.091022	-5.240	-0.544823	0.086684	-6.285
R SQUARED = 0.9110						
RMS ERROR = 0.333085						
NGF = 23						
R SQUARED = 0.9185						
RMS ERROR = 0.317212						
NGF = 23						

SYMPTOM	LOADER			DRIVER		
	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	3.353334	0.210557	15.926	3.815458	0.226685	16.832
UPPER GASTRO	-0.225547	0.040737	-5.537	-0.210782	0.043857	-4.806
LOWER GASTRO	-0.448839	0.102789	-4.347	-0.506874	0.110662	-4.580
FATIGUE/WEAK	-0.300574	0.051006	-5.803	-0.309476	0.054913	-5.636
HYPO TENSION	-0.181349	0.106080	-1.710	-0.184998	0.114206	-1.620
INFECT/BLEED	0.006172	0.129687	-0.048	-0.012316	0.139621	-0.088
FLUID LOSS	-0.520462	0.075854	-6.861	-0.439561	0.081664	-5.363
R SQUARED = 0.9367						
RMS ERROR = 0.277580						
NGF = 23						
R SQUARED = 0.9229						
RMS ERROR = 0.298843						
NGF = 23						

Table 10. TOW crew regression parameters.

SQUAD LEADER				GUNNER			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	3.861355	0.277212	13.929	3.568425	0.276925	12.886	
UPPER GASTRO	-0.229213	0.053150	-4.313	-0.242815	0.053095	-4.573	
LOWER GASTRO	-0.268881	0.136572	-1.969	-0.233592	0.136431	-1.712	
FATIGUE/WEAK	-0.368688	0.064496	-5.716	-0.377513	0.064430	-5.859	
HYPOTENSION	0.051657	0.132217	0.391	0.001518	0.132081	0.011	
INFECT/BLEED	-0.396030	0.111644	-3.547	-0.400014	0.111528	-3.587	
FLUID LOSS	-0.507480	0.098002	-5.178	-0.462964	0.097901	-4.933	
	R SQUARED = 0.8659			R SQUARED = 0.8721			
	RMS ERROR = 0.391040			RMS ERROR = 0.390636			
	DGF = 33			DGF = 33			

DRIVER				LOADER			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	5.122940	0.324222	15.801	4.261434	0.292214	14.583	
UPPER GASTRO	-0.244408	0.062164	-3.932	-0.251266	0.056027	-4.485	
LOWER GASTRO	-0.299380	0.159732	-1.874	-0.265417	0.143963	-1.844	
FATIGUE/WEAK	-0.486197	0.075434	-6.445	-0.523345	0.067987	-7.698	
HYPOTENSION	0.127268	0.154639	0.823	0.057344	0.139373	0.411	
INFECT/BLEED	-0.508780	0.130577	-3.896	-0.390862	0.117686	-3.321	
FLUID LOSS	-0.612157	0.114622	-5.341	-0.622272	0.103306	-6.024	
	R SQUARED = 0.8723			R SQUARED = 0.9048			
	RMS ERROR = 0.457354			RMS ERROR = 0.412203			
	DGF = 33			DGF = 33			

standard error of the β 's listed in the tables is the square root of the diagonals of the variance-covariance matrix of β

$$\sqrt{(\text{cov } \hat{\beta})_{ii}} = \hat{\sigma} \sqrt{(X'X)^{-1}_{ii}} . \quad (14)$$

Also given in those tables, for each crew type and symptom category, is a Student's t-statistic. That statistic is the ratio of the estimated β -parameter to the standard error. The Student's t values are a measure of each symptom category's importance. For the data analyzed with 23 to 33 degrees of freedom, values of $|t|$ less than about two indicate that the symptom category becomes nonsignificant. The regression analysis indicates that all crews considered both the FL and UG symptom categories as important (i.e., where $|t| \geq 2$), with FL the most important. The HY and IB categories were considered the least important compared with the others. Table 11 is a summary by crew position of the symptom categories judged to be the least significant (i.e., where $|t| \leq 2$).

The R^2 values are a global measure of goodness of fit of the data given by

$$R^2 = 1 - \frac{\sum_{k=1}^K (P_k - \hat{P}_k)^2}{\sum_{k=1}^K (P_k - \bar{P})^2} , \quad (15)$$

where P_k and \bar{P} are performance input and average performance input data, respectively, and \hat{P}_k are predicted values. The R^2 values are all quite large, indicating a good fit of the regression model with the data. The RMS error is the square root of the estimated variance of the residuals, indicated in the text above as $\hat{\sigma}$.

The regression diagnostics do not indicate any significant problem with collinearity (a linear combination formed by two independent variables). The seven eigenvalues of the normalized $(X'X)$ matrix are listed

Table 11. Least significant symptom categories.

Crew	Crew Position	Symptom Category			
		LG	FW	HY	IB
Gun	Chief of section			x	
	Gunner			✓	✓
	Assistant gunner			✓	✓
	Loader				
FDC	Fire direction officer		x	x	✓
	Horizontal control operator			✓	x
	Computer		✓		x
Tank	Tank commander			✓	x
	Gunner			✓	x
	Loader			✓	x
	Driver			✓	x
TOW	Squad leader	✓		x	
	Gunner	✓		x	
	Driver	✓		x	
	Loader	✓		x	

NOTE: x = Student's $|t| < 1$,
 ✓ = $1 \leq \text{Student's } |t| < 2$.

in Table 12 with the *condition index*, which is obtained by dividing the square root of the top eigenvalue $\sqrt{6.203}$ by the square root of the others (including itself). All values of the condition index are much less than about 30, which indicates no significant collinearity relationship.

Applying the inverse transformation to the logit regression relationship yields the formula for predicting expected values of performance \hat{p}_k for the k th symptom complex given by

$$\hat{p}_k = \frac{1}{1 + \exp(-\mathbf{x}_k' \hat{\beta})} \quad (16)$$

Table 12. Eigenvalue condition indexes.

Eigenvalue (v_i)	Condition Index ($\sqrt{v_1/v_i}$)
6.203	1.0
0.282040	4.690
0.215428	5.366
0.134011	6.803
0.073825	9.166
0.051828	10.940
0.039971	12.457

The upper and lower 95 percent confidence bounds for the predicted expected values of performance are given by

$$UL_{95,m} = \frac{1}{\{1 + \exp [- (x_k' \hat{\beta} + 2.08 \hat{\sigma}_m)]\}} , \quad (17)$$

and

$$LL_{95,m} = \frac{1}{\{1 + \exp [- (x_k' \hat{\beta} - 2.08 \hat{\sigma}_m)]\}} . \quad (18)$$

The upper and lower 95 percent confidence bounds for further predicted observed values of performance are given by

$$UL_{95,0} = \frac{1}{\{1 + \exp [- (x_k' \hat{\beta} + 2.08 \hat{\sigma}_0)]\}} , \quad (19)$$

and

$$LL_{95,0} = \frac{1}{\{1 + \exp [- (x_k' \hat{\beta} - 2.08 \hat{\sigma}_0)]\}} . \quad (20)$$

Tables 13 through 27 list the predicted expected and actual (observed) data performance values for crewmember positions, the upper and lower 95 percent confidence bounds $UL_{95,m}$ and $LL_{95,m}$, for each of 30 symptom complexes (x'_k) for the artillery (gun and FDC) and tank crews; and each of 40 symptom complexes for the TOW crew. The listing order in the tables is arranged from highest to lowest value of performance predicted by the regression formula. The values of $(1 - P_k)$ termed performance degradation are also listed.

Figures 17 through 31 are plots of the crewmember performance data given in Tables 13 through 27. Performance P_k is plotted against $(1 - P_k)$, which yields the straight line shown. For purposes of illustration, values of performance predicted by the regression relationship lie along the straight line at coordinates $[(1 - \hat{P}_k), \hat{P}_k]$ for each k th symptom complex. The actual data values are given by the asterisks, which have coordinates $[(1 - \hat{P}_k), P_k]$. The unevenly spaced tick marks along the top edge of the abscissa correspond to each of the ordered symptom complexes listed in Tables 13 through 27. The two sets of error bars each designate upper and lower 95 percent confidence bounds for the prediction of performance along the regression line. The solid line bars are for the expected mean performance values that correspond to the $UL_{95,m}$ and $LL_{95,m}$ bounds. The wider dotted line bars are for further data observations that correspond to the $UL_{95,0}$ and $LL_{95,0}$ bounds. The plots indicate a substantial portion of the data included even within the narrower predicted mean value confidence bounds. A much larger portion of the data is included within the wider 95 percent confidence bounds as would be expected for further observed values of performance (i.e., additional data). Expanding the confidence limits by 12 to 30 percent by multiplying them by the inflation factor $1/\sqrt{1 - \rho}$ to account for correlated response data, where estimates are $\rho = 0.2$ to 0.4 , would include essentially all of the data. However, the extent to which variation in response data about the regression line can be attributed to either nonlinearities that might exist in the symptom severity levels (integer values 1 through 5 were assumed) or simply variations in performance judgment, cannot be ascertained for reasons previously discussed (see p. 59).

Table 13. Gun crew individual performance: chief of section.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	112111	0.2685	0.73145	0.81306	0.67478	0.78126
2	211111	0.2774	0.72256	0.67100	0.66149	0.77626
3	113111	0.3057	0.69432	0.81107	0.63454	0.74819
4	311111	0.3249	0.67510	0.69600	0.61140	0.73302
5	114111	0.3455	0.65454	0.69100	0.57861	0.72334
6	213111	0.3556	0.64441	0.60500	0.59741	0.68879
7	312111	0.3659	0.63415	0.61200	0.58877	0.67726
8	411111	0.3762	0.62376	0.53000	0.54979	0.69237
9	113121	0.3851	0.61490	0.55500	0.52196	0.70016
10	123111	0.3881	0.61185	0.64200	0.52799	0.68958
11	313111	0.4088	0.59115	0.65800	0.54948	0.63155
12	412111	0.4196	0.58035	0.55700	0.52531	0.63347
13	413111	0.4643	0.53567	0.55900	0.48626	0.58438
14	224111	0.4880	0.51199	0.36200	0.43957	0.58391
15	414111	0.5096	0.49040	0.49100	0.42870	0.55239
16	313112	0.5164	0.48360	0.46900	0.43661	0.53088
17	513111	0.5207	0.47928	0.51500	0.41373	0.54555
18	521111	0.5214	0.47862	0.53000	0.37414	0.58501
19	314112	0.5614	0.43858	0.39400	0.39014	0.48822
20	514111	0.5657	0.43432	0.40900	0.36244	0.50908
21	414112	0.6160	0.38397	0.36800	0.33381	0.43672
22	515311	0.6406	0.35942	0.38700	0.25578	0.47812
23	314113	0.6640	0.33598	0.25200	0.26982	0.40927
24	525111	0.6923	0.30772	0.28700	0.24104	0.38348
25	315113	0.7032	0.29680	0.25502	0.23130	0.37188
26	535111	0.7642	0.23577	0.26096	0.16219	0.32966
27	334231	0.7882	0.21182	0.22097	0.13424	0.31762
28	515431	0.7940	0.20603	0.15499	0.12909	0.31245
29	415314	0.8396	0.16043	0.15499	0.09850	0.25049
30	515223	0.8498	0.15020	0.28900	0.10603	0.20850

Table 14. Gun crew individual performance: gunner.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	211111	0.1680	0.83202	0.82807	0.79560	0.86307
2	112111	0.1821	0.81787	0.81593	0.78126	0.84941
3	311111	0.1894	0.81061	0.87303	0.77206	0.84396
4	411111	0.2128	0.78718	0.73100	0.74097	0.82693
5	113111	0.2215	0.77851	0.85705	0.73711	0.81487
6	312111	0.2299	0.77012	0.70900	0.74039	0.79738
7	213111	0.2479	0.75213	0.78600	0.71957	0.78211
8	113121	0.2541	0.74593	0.70000	0.68077	0.80155
9	412111	0.2567	0.74326	0.72800	0.70586	0.77730
10	114111	0.2666	0.73341	0.73000	0.67723	0.78279
11	313111	0.2761	0.72391	0.78194	0.69445	0.75157
12	123111	0.2901	0.70989	0.70700	0.64719	0.76549
13	413111	0.3063	0.69374	0.69400	0.65733	0.72788
14	521111	0.3101	0.68988	0.69800	0.60807	0.76133
15	513111	0.3382	0.66180	0.64300	0.61020	0.70981
16	414111	0.3606	0.63938	0.60000	0.58994	0.68603
17	313112	0.3719	0.62814	0.63100	0.59030	0.66447
18	224111	0.3767	0.62330	0.54000	0.56445	0.67873
19	514111	0.3950	0.60500	0.59200	0.54336	0.66348
20	314112	0.4306	0.56937	0.50900	0.52782	0.60096
21	414112	0.4668	0.53319	0.53500	0.48740	0.57843
22	314113	0.5400	0.45998	0.41700	0.39545	0.52587
23	515311	0.5412	0.45884	0.53400	0.35964	0.56141
24	525111	0.5450	0.45504	0.40600	0.38636	0.52547
25	315113	0.6000	0.40001	0.40400	0.33410	0.46976
26	334231	0.6313	0.36874	0.38400	0.26910	0.48099
27	535111	0.6323	0.36771	0.41400	0.28215	0.46251
28	515431	0.6678	0.33221	0.27500	0.23704	0.44334
29	515223	0.7410	0.25903	0.39900	0.20005	0.32826
30	415314	0.7922	0.20784	0.16995	0.14088	0.29567

Table 15. Gun crew individual performance: assistant gunner.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	211111	0.1917	0.80630	0.80298	0.77312	0.83916
2	112111	0.2112	0.78885	0.78801	0.75325	0.82039
3	311111	0.2135	0.78651	0.83202	0.74988	0.81906
4	411111	0.2370	0.76296	0.74895	0.71963	0.80155
5	113111	0.2571	0.74288	0.82201	0.70301	0.77903
6	312111	0.2596	0.74039	0.70000	0.71215	0.76656
7	213111	0.2838	0.71623	0.71100	0.68518	0.74536
8	412111	0.2865	0.71352	0.70900	0.67860	0.74612
9	113121	0.3005	0.69952	0.67500	0.63721	0.75528
10	114111	0.3091	0.69086	0.69000	0.63771	0.73943
11	313111	0.3120	0.68802	0.76296	0.66032	0.71443
12	123111	0.3331	0.66688	0.67000	0.60822	0.72080
13	521111	0.3390	0.66096	0.65800	0.58652	0.72821
14	413111	0.3417	0.65833	0.65200	0.62462	0.69052
15	513111	0.3726	0.62736	0.58200	0.58029	0.67212
16	414111	0.4015	0.59849	0.56100	0.55349	0.64189
17	313112	0.4121	0.58794	0.57500	0.55358	0.62147
18	224111	0.4250	0.57504	0.50100	0.52169	0.62670
19	514111	0.4343	0.56567	0.54400	0.51035	0.61940
20	314112	0.4753	0.52467	0.47900	0.48767	0.56141
21	414112	0.5091	0.49095	0.49000	0.45066	0.53136
22	515311	0.5628	0.43718	0.51500	0.35067	0.52769
23	314113	0.5834	0.41663	0.37100	0.36133	0.47411
24	525111	0.5888	0.41116	0.37000	0.35245	0.47251
25	315113	0.6441	0.35588	0.35900	0.30065	0.41522
26	535111	0.6739	0.32610	0.37700	0.25502	0.40609
27	334231	0.6815	0.31845	0.32100	0.23722	0.41251
28	515431	0.6930	0.30698	0.25200	0.22618	0.40155
29	515223	0.7701	0.22988	0.36100	0.18168	0.28631
30	415314	0.8060	0.19404	0.16097	0.13729	0.26718

Table 16. Gun crew individual performance: loader.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	211111	0.3186	0.68137	0.65000	0.64467	0.71595
2	311111	0.3513	0.64871	0.65300	0.61163	0.68408
3	112111	0.3528	0.64718	0.69000	0.61091	0.68184
4	411111	0.3854	0.61459	0.56500	0.57241	0.65512
5	312111	0.4223	0.57768	0.55600	0.55078	0.60412
6	113111	0.4239	0.57605	0.69700	0.53813	0.61309
7	412111	0.4585	0.54154	0.52000	0.50974	0.57300
8	213111	0.4601	0.53988	0.54200	0.51136	0.56814
9	113121	0.4824	0.51764	0.47300	0.46334	0.57154
10	521111	0.4934	0.50664	0.55000	0.44548	0.56760
11	123111	0.4967	0.50330	0.50200	0.45435	0.55220
12	313111	0.4967	0.50329	0.55900	0.47895	0.52760
13	114111	0.4984	0.50162	0.45200	0.45566	0.54755
14	413111	0.5333	0.46666	0.49600	0.43860	0.49492
15	513111	0.5696	0.43038	0.39600	0.39357	0.46798
16	313112	0.6051	0.39490	0.38700	0.36933	0.42107
17	224111	0.6067	0.39326	0.33000	0.35432	0.43361
18	414111	0.6068	0.39325	0.37000	0.35984	0.42768
19	514111	0.6412	0.35884	0.36200	0.32029	0.39930
20	314112	0.6741	0.32589	0.34400	0.30128	0.35149
21	414112	0.7055	0.29451	0.29500	0.26924	0.32112
22	314113	0.7626	0.23740	0.22305	0.20636	0.27153
23	525111	0.7639	0.23613	0.22794	0.20327	0.27259
24	515311	0.7811	0.21892	0.24899	0.17480	0.27072
25	535111	0.8126	0.18740	0.18694	0.15008	0.23148
26	315113	0.8126	0.18740	0.17902	0.15963	0.21874
27	334231	0.8236	0.17639	0.18801	0.13517	0.22671
28	515431	0.8742	0.12576	0.10997	0.09449	0.16548
29	515223	0.8995	0.10047	0.13401	0.08166	0.12314
30	415314	0.9202	0.07980	0.06998	0.05925	0.10679

Table 17. FDC crew individual performance: fire direction officer.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	112111	0.1606	0.83943	0.90602	0.78381	0.88298
2	113111	0.1701	0.82991	0.94401	0.77259	0.87512
3	114111	0.1802	0.81980	0.77903	0.74668	0.87534
4	211111	0.1832	0.81683	0.70200	0.75176	0.86784
5	213111	0.2051	0.79495	0.80799	0.74763	0.83548
6	113121	0.2069	0.79315	0.70400	0.69666	0.86483
7	311111	0.2201	0.77989	0.77799	0.70899	0.83753
8	312111	0.2322	0.76781	0.69300	0.71870	0.81046
9	313111	0.2449	0.75510	0.78701	0.71025	0.79495
10	123111	0.2573	0.74269	0.77903	0.64507	0.82083
11	411111	0.2619	0.73808	0.69700	0.65112	0.80969
12	412111	0.2756	0.72438	0.76692	0.66058	0.78023
13	413111	0.2898	0.71025	0.82201	0.65246	0.76188
14	414111	0.3043	0.69569	0.69800	0.62048	0.76170
15	224111	0.3185	0.68150	0.48200	0.59113	0.76006
16	513111	0.3391	0.66088	0.60900	0.57668	0.73595
17	313112	0.3450	0.65503	0.65000	0.59534	0.71021
18	514111	0.3549	0.54508	0.62500	0.54795	0.73165
19	314112	0.3609	0.63911	0.54900	0.57498	0.69864
20	414112	0.4153	0.58471	0.62700	0.51199	0.65392
21	521111	0.4300	0.56998	0.59700	0.42644	0.70264
22	515311	0.4525	0.54748	0.50900	0.38453	0.70085
23	314113	0.4783	0.52169	0.42800	0.41659	0.62490
24	315113	0.4957	0.50427	0.47300	0.39196	0.61615
25	525111	0.4993	0.50072	0.49400	0.38934	0.61202
26	515431	0.6130	0.38696	0.35300	0.22882	0.57320
27	535111	0.6276	0.37238	0.41100	0.24031	0.52661
28	334231	0.6557	0.34430	0.37000	0.20021	0.52407
29	515223	0.7008	0.29917	0.42400	0.19957	0.42227
30	415314	0.7377	0.26231	0.27100	0.14332	0.43034

Table 18. FDC crew individual performance: horizontal control operator.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	112111	0.2752	0.76477	0.79803	0.72642	0.79931
2	211111	0.2522	0.74782	0.69700	0.70539	0.78600
3	113111	0.2531	0.74687	0.86105	0.70708	0.78279
4	113121	0.2721	0.72795	0.65300	0.66837	0.78040
5	114111	0.2721	0.72789	0.74307	0.67782	0.77277
6	311111	0.2895	0.71047	0.67400	0.66602	0.75120
7	213111	0.2907	0.70930	0.69200	0.67763	0.73904
8	312111	0.3100	0.68998	0.68500	0.65869	0.71962
9	123111	0.3237	0.67628	0.69300	0.61797	0.72959
10	411111	0.3300	0.66997	0.67200	0.61777	0.71830
11	313111	0.3313	0.66871	0.64400	0.64002	0.69620
12	412111	0.3520	0.64803	0.69300	0.60925	0.68495
13	413111	0.3746	0.62545	0.67200	0.59029	0.65933
14	224111	0.3895	0.61051	0.46100	0.55788	0.63793
15	414111	0.3977	0.60231	0.59600	0.55715	0.64579
16	313112	0.4058	0.59422	0.62400	0.55978	0.62776
17	513111	0.4199	0.58009	0.53300	0.53122	0.62743
18	314112	0.4295	0.57048	0.55800	0.53365	0.60654
19	514111	0.4439	0.55613	0.55000	0.50034	0.61055
20	521111	0.4567	0.54329	0.55400	0.46350	0.62092
21	414112	0.4765	0.52353	0.56900	0.48286	0.56388
22	314113	0.5093	0.49072	0.45300	0.43255	0.54915
23	315113	0.5336	0.46636	0.43900	0.40440	0.52937
24	515311	0.5352	0.46480	0.44000	0.37598	0.55592
25	525111	0.5540	0.44596	0.46700	0.38518	0.50839
26	334231	0.6021	0.39793	0.43100	0.30496	0.49890
27	515431	0.6154	0.38459	0.37900	0.29155	0.48691
28	535111	0.6369	0.36312	0.37800	0.28707	0.44668
29	515223	0.6783	0.32175	0.35000	0.26057	0.38979
30	415314	0.7138	0.28615	0.28700	0.20899	0.37823

Table 19. FDC crew individual performance: computer.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	112111	0.1790	0.82098	0.86704	0.78951	0.84864
2	113111	0.1902	0.80984	0.88205	0.77747	0.83849
3	211111	0.1925	0.80752	0.74193	0.77242	0.83835
4	113121	0.1985	0.80155	0.78701	0.75325	0.84251
5	114111	0.2018	0.79319	0.76906	0.75731	0.83383
6	213111	0.2164	0.78364	0.77903	0.75750	0.80752
7	311111	0.2189	0.78108	0.76296	0.74403	0.81412
8	312111	0.2318	0.76817	0.74706	0.74212	0.79233
9	313111	0.2451	0.75491	0.76206	0.73085	0.77730
10	411111	0.2479	0.75213	0.72500	0.70767	0.79167
11	412111	0.2619	0.73808	0.75399	0.70505	0.76852
12	123111	0.2639	0.73614	0.73100	0.68422	0.78245
13	413111	0.2764	0.72357	0.82201	0.69343	0.75176
14	414111	0.2914	0.70858	0.69300	0.66928	0.74498
15	513111	0.3100	0.68995	0.66000	0.64654	0.73026
16	224111	0.3121	0.68791	0.56800	0.64007	0.73204
17	313112	0.3160	0.68405	0.72200	0.65311	0.71344
18	514111	0.3260	0.67396	0.64000	0.62348	0.72071
19	314112	0.3321	0.66790	0.66200	0.63442	0.69976
20	414112	0.3690	0.63097	0.64900	0.59274	0.66763
21	521111	0.3718	0.62822	0.64200	0.55182	0.69871
22	314113	0.4142	0.58580	0.55500	0.52864	0.64073
23	315113	0.4322	0.56780	0.53700	0.50578	0.62777
24	525111	0.4428	0.55716	0.55800	0.49541	0.61720
25	515311	0.4444	0.55555	0.56800	0.46537	0.64221
26	515431	0.5243	0.47569	0.44400	0.37502	0.57837
27	334231	0.5288	0.47123	0.50400	0.37270	0.57206
28	535111	0.5481	0.45187	0.47900	0.36882	0.53770
29	515223	0.5792	0.42084	0.44100	0.35120	0.49379
30	415314	0.6617	0.33831	0.34600	0.25275	0.43583

Table 20. Tank crew individual performance: tank commander.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	112111	0.1468	0.85321	0.89003	0.81653	0.88360
2	211111	0.1554	0.84462	0.85705	0.80392	0.87825
3	113111	0.1792	0.82083	0.90203	0.77868	0.85644
4	113121	0.1857	0.81427	0.84198	0.75120	0.86436
5	311111	0.1996	0.80043	0.77206	0.75325	0.84051
6	114111	0.2169	0.78313	0.68500	0.72476	0.83216
7	213111	0.2283	0.77171	0.73808	0.73517	0.80440
8	312111	0.2403	0.75969	0.72000	0.72380	0.79233
9	411111	0.2527	0.74725	0.68000	0.68659	0.79979
10	123111	0.2644	0.73556	0.76296	0.66515	0.79576
11	313111	0.2863	0.71367	0.75306	0.67835	0.74649
12	412111	0.3001	0.69986	0.75306	0.65197	0.74384
13	413111	0.3523	0.64766	0.69200	0.60216	0.69064
14	224111	0.3820	0.61795	0.56700	0.54865	0.68277
15	313112	0.3926	0.60739	0.52300	0.56229	0.65073
16	414111	0.4083	0.59169	0.63300	0.53163	0.64913
17	513111	0.4245	0.57549	0.60300	0.51085	0.63764
18	521111	0.4302	0.56976	0.56300	0.46496	0.66865
19	314112	0.4505	0.54947	0.46900	0.50058	0.59743
20	514111	0.4834	0.51661	0.48800	0.44307	0.58943
21	414112	0.5265	0.47353	0.48800	0.42060	0.52707
22	314113	0.5692	0.43085	0.33500	0.35732	0.50756
23	315113	0.6263	0.37373	0.35400	0.29973	0.45416
24	515311	0.6295	0.37055	0.37800	0.26678	0.48791
25	334231	0.6433	0.35671	0.31700	0.24435	0.48747
26	525111	0.6616	0.33839	0.27300	0.26894	0.41569
27	515431	0.6893	0.31072	0.26096	0.20636	0.43865
28	535111	0.7631	0.23685	0.31200	0.16410	0.32925
29	515223	0.7938	0.20620	0.33200	0.14931	0.27758
30	415314	0.8397	0.16030	0.17393	0.09930	0.24843

Table 21. Tank crew individual performance: gunner.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	112111	0.1027	0.89734	0.94202	0.87147	0.91849
2	211111	0.1148	0.88524	0.87900	0.85508	0.90987
3	113121	0.1174	0.88257	0.89798	0.84037	0.91467
4	113111	0.1209	0.87911	0.92498	0.84980	0.90344
5	114111	0.1417	0.85827	0.79899	0.81757	0.89110
6	311111	0.1499	0.85005	0.82506	0.81382	0.88027
7	213111	0.1576	0.84237	0.81306	0.81593	0.86565
8	312111	0.1748	0.82520	0.78194	0.79786	0.84954
9	411111	0.1936	0.80643	0.75194	0.75786	0.84723
10	123111	0.1977	0.80234	0.82807	0.74649	0.84839
11	313111	0.2029	0.79706	0.81995	0.77012	0.82171
12	412111	0.2237	0.77626	0.81199	0.73788	0.81031
13	413111	0.2573	0.74269	0.78398	0.70585	0.77643
14	224111	0.2870	0.71298	0.65500	0.65427	0.76531
15	414111	0.2938	0.70620	0.71700	0.65574	0.75213
16	313112	0.3050	0.69499	0.62900	0.65623	0.73126
17	513111	0.3203	0.67970	0.70800	0.62339	0.73126
18	314112	0.3452	0.65479	0.57000	0.61142	0.69573
19	514111	0.3615	0.63853	0.64500	0.57148	0.70059
20	521111	0.3691	0.63091	0.64300	0.53369	0.71855
21	414112	0.4177	0.58229	0.58200	0.53197	0.63095
22	314113	0.4762	0.52382	0.45500	0.45052	0.59610
23	515111	0.5097	0.49030	0.51800	0.37816	0.60343
24	315113	0.5220	0.47800	0.47000	0.40021	0.55687
25	334231	0.5322	0.46779	0.43400	0.34461	0.59504
26	515431	0.5465	0.45347	0.39400	0.32948	0.58353
27	525111	0.5492	0.45079	0.37500	0.37478	0.52917
28	535111	0.6858	0.31420	0.38600	0.22846	0.41474
29	515223	0.7077	0.29233	0.43000	0.22149	0.37498
30	415314	0.7966	0.20343	0.20702	0.13147	0.30107

Table 22. Tank crew individual performance: loader.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	211111	0.1908	0.80923	0.81503	0.77030	0.84290
2	112111	0.2026	0.79738	0.84104	0.75896	0.83090
3	311111	0.2281	0.77189	0.74097	0.72941	0.80954
4	113111	0.2556	0.74441	0.83603	0.70044	0.78398
5	113121	0.2567	0.74326	0.74193	0.67962	0.79803
6	411111	0.2702	0.72983	0.70400	0.67777	0.77626
7	312111	0.2852	0.71478	0.66600	0.68185	0.74555
8	213111	0.3008	0.69924	0.66300	0.66376	0.73243
9	114111	0.3168	0.68323	0.59400	0.62366	0.73730
10	412111	0.3333	0.66667	0.68100	0.62498	0.70591
11	123111	0.3497	0.65031	0.68300	0.58411	0.71118
12	313111	0.3502	0.64980	0.68300	0.61749	0.68079
13	413111	0.4031	0.59691	0.64200	0.55741	0.63519
14	521111	0.4208	0.57917	0.54400	0.49208	0.66159
15	513111	0.4583	0.54167	0.60700	0.48742	0.59495
16	313112	0.4756	0.52440	0.44400	0.48569	0.56282
17	224111	0.4764	0.52355	0.51800	0.46412	0.58233
18	414111	0.4770	0.52299	0.52100	0.47214	0.57337
19	514111	0.5333	0.46667	0.49200	0.40625	0.52809
20	314112	0.5505	0.44945	0.43400	0.40941	0.49016
21	414112	0.6055	0.39450	0.44600	0.35273	0.43787
22	314113	0.6733	0.32666	0.25407	0.27278	0.38553
23	334231	0.6843	0.31566	0.33500	0.22741	0.41966
24	515311	0.6893	0.31071	0.32600	0.23183	0.40239
25	525111	0.7074	0.29257	0.24694	0.23903	0.35253
26	515431	0.7292	0.27092	0.20603	0.19016	0.37004
27	315113	0.7358	0.26425	0.20505	0.21400	0.32149
28	535111	0.7912	0.20883	0.21501	0.15277	0.27887
29	515223	0.8406	0.15436	0.24694	0.12036	0.20817
30	415314	0.8941	0.10593	0.12100	0.06978	0.15776

Table 23. Tank crew individual performance: driver.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	211111	0.1255	0.87446	0.86796	0.84396	0.89971
2	112111	0.1368	0.86319	0.89604	0.83230	0.88904
3	311111	0.1506	0.84941	0.87501	0.81533	0.87815
4	113111	0.1777	0.82230	0.91003	0.78516	0.85433
5	113121	0.1795	0.82054	0.81802	0.76585	0.86471
6	411111	0.1796	0.82039	0.78108	0.77730	0.85668
7	312111	0.1947	0.80534	0.75101	0.77765	0.83048
8	213111	0.2105	0.78951	0.79803	0.75878	0.81728
9	114111	0.2274	0.77259	0.67200	0.71896	0.81862
10	412111	0.2297	0.77030	0.77206	0.73361	0.80313
11	313111	0.2477	0.75232	0.77294	0.72332	0.77920
12	123111	0.2639	0.73614	0.71700	0.67335	0.79051
13	413111	0.2890	0.71098	0.76296	0.67388	0.74536
14	521111	0.3097	0.69028	0.65200	0.60432	0.76477
15	513111	0.3342	0.66583	0.69000	0.61190	0.71574
16	313112	0.3382	0.66181	0.57600	0.62354	0.69808
17	414111	0.3565	0.64352	0.63500	0.59183	0.69207
18	224111	0.3763	0.62372	0.62400	0.56195	0.68171
19	514111	0.4062	0.59385	0.63500	0.52874	0.65582
20	314112	0.4105	0.58950	0.53600	0.54633	0.63134
21	414112	0.4623	0.53771	0.56500	0.48970	0.58502
22	314113	0.5194	0.48059	0.44000	0.41228	0.54964
23	515311	0.5743	0.42566	0.39800	0.32485	0.53306
24	315113	0.5956	0.40441	0.32800	0.33507	0.47778
25	334231	0.6039	0.39606	0.39000	0.28782	0.51553
26	525111	0.6074	0.39259	0.35100	0.32464	0.46496
27	515431	0.6246	0.37538	0.33200	0.26835	0.49609
28	535111	0.7198	0.28023	0.33300	0.20522	0.36995
29	515223	0.7322	0.26776	0.36400	0.20457	0.34198
30	415314	0.8033	0.19671	0.22794	0.13011	0.28604

Table 24. TOW crew individual performance: squad leader.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	211111	0.1285	0.87147	0.87900	0.83548	0.90043
2	112111	0.1450	0.85495	0.89898	0.81847	0.88514
3	111121	0.1484	0.85157	0.93401	0.81275	0.88350
4	311111	0.1566	0.84343	0.82607	0.80187	0.87761
5	212111	0.1758	0.82419	0.83299	0.79167	0.85246
6	411111	0.1892	0.81077	0.74307	0.75639	0.85545
7	113111	0.1970	0.80298	0.86796	0.75768	0.84158
8	112121	0.2013	0.79867	0.89100	0.75969	0.83272
9	111131	0.2057	0.79429	0.67600	0.72351	0.85056
10	312111	0.2115	0.78852	0.71000	0.75343	0.81965
11	213111	0.2358	0.76423	0.79101	0.72684	0.79803
12	123111	0.2431	0.75694	0.76602	0.68373	0.81787
13	412111	0.2524	0.74763	0.76995	0.69955	0.79051
14	114111	0.2617	0.73827	0.71800	0.67164	0.79543
15	113121	0.2672	0.73282	0.81306	0.68240	0.77799
16	112131	0.2725	0.72750	0.61500	0.64910	0.79397
17	521111	0.2775	0.72252	0.72200	0.62251	0.80440
18	313111	0.2795	0.72050	0.69600	0.68359	0.75473
19	413111	0.3279	0.67210	0.69900	0.62280	0.71788
20	113131	0.3513	0.64869	0.64800	0.55545	0.73184
21	314111	0.3593	0.64066	0.58000	0.58381	0.69382
22	224111	0.3685	0.63148	0.60500	0.55730	0.69992
23	114112	0.3707	0.62929	0.48900	0.56305	0.69100
24	513111	0.3802	0.61975	0.59200	0.54876	0.68596
25	313112	0.3919	0.60813	0.51300	0.56269	0.65176
26	414111	0.4136	0.58638	0.64800	0.52120	0.64867
27	214112	0.4256	0.57443	0.45200	0.52189	0.62535
28	514111	0.4701	0.52992	0.54200	0.44894	0.60934
29	314112	0.4823	0.51768	0.49800	0.46926	0.56577
30	515311	0.5363	0.46367	0.40200	0.35061	0.58059
31	414112	0.5395	0.46047	0.49500	0.40379	0.51818
32	214113	0.5517	0.44831	0.34300	0.37157	0.52758
33	314113	0.6075	0.39252	0.40200	0.32116	0.46879
34	525111	0.6266	0.37338	0.37800	0.29555	0.45836
35	334231	0.6682	0.33183	0.28700	0.22426	0.46033
36	535111	0.6871	0.31289	0.36500	0.21806	0.42659
37	315113	0.6911	0.30887	0.32500	0.24269	0.38383
38	515431	0.7081	0.29194	0.26698	0.18422	0.42943
39	415314	0.8083	0.19170	0.21098	0.11899	0.29406
40	515223	0.8331	0.16687	0.31800	0.11816	0.23041

Table 25. TOW crew individual performance: gunner.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	211111	0.1694	0.83062	0.85296	0.78617	0.86738
2	112111	0.1891	0.81092	0.86495	0.76638	0.84851
3	111121	0.1926	0.80737	0.91396	0.76024	0.84710
4	311111	0.2064	0.79364	0.75007	0.74307	0.83658
5	212111	0.2292	0.77083	0.74193	0.73184	0.80565
6	411111	0.2488	0.75120	0.65800	0.68619	0.80643
7	113111	0.2539	0.74612	0.83005	0.69283	0.79298
8	112121	0.2581	0.74193	0.86295	0.69607	0.78279
9	111131	0.2625	0.73750	0.61300	0.65581	0.80550
10	312111	0.2749	0.72510	0.63800	0.68391	0.76278
11	123111	0.3006	0.69940	0.71900	0.61758	0.77030
12	213111	0.3025	0.69745	0.62700	0.65429	0.73730
13	412111	0.3258	0.67417	0.75007	0.61919	0.72474
14	114111	0.3317	0.66830	0.59600	0.59382	0.73517
15	113121	0.3367	0.66329	0.76799	0.60677	0.71550
16	112131	0.3418	0.65825	0.55700	0.57175	0.73536
17	521111	0.3479	0.65208	0.63300	0.54287	0.74725
18	313111	0.3561	0.64391	0.65600	0.60252	0.68326
19	413111	0.4135	0.58651	0.60400	0.53333	0.63775
20	113131	0.4309	0.56905	0.57600	0.47198	0.66109
21	224111	0.4442	0.55579	0.53900	0.47903	0.62998
22	114112	0.4458	0.55417	0.42500	0.48555	0.62079
23	314111	0.4465	0.55351	0.49100	0.49384	0.61169
24	313112	0.4727	0.52733	0.45400	0.48058	0.57360
25	513111	0.4733	0.52666	0.51100	0.45369	0.59851
26	214112	0.5063	0.49368	0.41600	0.44093	0.54658
27	414111	0.5070	0.49302	0.54500	0.42755	0.55872
28	314112	0.5666	0.43338	0.41200	0.38657	0.48140
29	514111	0.5673	0.43272	0.46700	0.35545	0.51341
30	214113	0.6244	0.37561	0.25597	0.30452	0.45249
31	414112	0.6250	0.37498	0.41500	0.32259	0.43047
32	515311	0.6559	0.34406	0.28200	0.24675	0.45638
33	314113	0.6794	0.32059	0.31600	0.25693	0.39183
34	525111	0.7072	0.29279	0.33700	0.22583	0.37019
35	334231	0.7410	0.25903	0.20899	0.16924	0.37509
36	535111	0.7531	0.24694	0.28700	0.16714	0.34862
37	315113	0.7557	0.24435	0.27800	0.18847	0.31071
38	515431	0.8091	0.19093	0.17902	0.11456	0.30099
39	415314	0.8642	0.13576	0.18005	0.08211	0.21602
40	515223	0.8822	0.11784	0.16995	0.08211	0.16645

Table 26. TOW crew individual performance: driver.

	SYMPTOM COMPLEX	PERFORMANCE DEGRADATION	PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS	
					LOW 95%	HIGH 95%
1	211111	0.0544	0.94558	0.94501	0.92539	0.96053
2	112111	0.0683	0.93169	0.96401	0.90888	0.94912
3	311111	0.0685	0.93150	0.92601	0.90687	0.95003
4	111121	0.0697	0.93028	0.97301	0.90585	0.94868
5	212111	0.0856	0.91443	0.88205	0.89321	0.93176
6	411111	0.0858	0.91420	0.92301	0.87964	0.93952
7	113111	0.1065	0.89350	0.91698	0.86021	0.91961
8	312111	0.1068	0.89321	0.85396	0.86898	0.91341
9	112121	0.1087	0.89129	0.94799	0.86283	0.91451
10	111131	0.1109	0.88914	0.78006	0.83576	0.92663
11	213111	0.1322	0.86784	0.85594	0.83916	0.89216
12	412111	0.1324	0.86761	0.89302	0.83174	0.89678
13	123111	0.1385	0.86152	0.87303	0.80218	0.90508
14	521111	0.1392	0.86081	0.77609	0.78381	0.91349
15	114111	0.1623	0.83767	0.78600	0.77989	0.88247
16	313111	0.1627	0.83726	0.90097	0.80721	0.86354
17	113121	0.1655	0.83452	0.89501	0.79117	0.87034
18	112131	0.1685	0.83146	0.77101	0.76242	0.88340
19	413111	0.1988	0.80123	0.82707	0.75786	0.83849
20	314111	0.2401	0.75988	0.70100	0.70504	0.80721
21	513111	0.2407	0.75933	0.72900	0.69142	0.81638
22	113131	0.2481	0.75194	0.75306	0.65758	0.82721
23	224111	0.2503	0.74970	0.78499	0.67618	0.81123
24	114112	0.2633	0.73672	0.52800	0.66955	0.79429
25	313112	0.2639	0.73614	0.64100	0.69143	0.77643
26	414111	0.2875	0.71248	0.74097	0.64531	0.77136
27	214112	0.3134	0.68657	0.57400	0.63083	0.73730
28	514111	0.3401	0.65995	0.70000	0.57034	0.73943
29	314112	0.3683	0.63175	0.58600	0.57761	0.68276
30	515311	0.3938	0.60621	0.53000	0.47023	0.72751
31	414112	0.4267	0.57330	0.58600	0.50622	0.63778
32	214113	0.4571	0.54289	0.45500	0.45019	0.63271
33	314113	0.5181	0.48190	0.45500	0.39245	0.57253
34	525111	0.5306	0.46941	0.46800	0.36986	0.57146
35	334231	0.5835	0.41650	0.39100	0.27491	0.57334
36	535111	0.6039	0.39606	0.45700	0.26973	0.53797
37	515431	0.6128	0.38725	0.34400	0.23812	0.56093
38	315113	0.6361	0.36386	0.44200	0.27948	0.45755
39	415314	0.7615	0.23849	0.30100	0.13955	0.37704
40	515223	0.8067	0.19325	0.31500	0.13022	0.27715

Table 27. TOW crew individual performance: loader.

SYMPTOM PERFORMANCE COMPLEX DEGRADATION			PREDICTED VALUE	ACTUAL VALUE	CONFIDENCE LEVELS LOW 95% HIGH 95%	
1	211111	0.1177	0.88226	0.87599	0.84684	0.91036
2	111121	0.1330	0.86704	0.93002	0.82935	0.89743
3	311111	0.1464	0.85358	0.83299	0.81169	0.88745
4	112111	0.1491	0.85094	0.87203	0.81153	0.88340
5	411111	0.1806	0.81936	0.78499	0.76351	0.86436
6	212111	0.1838	0.81623	0.78801	0.78074	0.84710
7	111131	0.1848	0.81518	0.69900	0.74536	0.86921
8	112121	0.2057	0.79429	0.85705	0.75250	0.83076
9	312111	0.2244	0.77556	0.76495	0.73711	0.80984
10	113111	0.2281	0.77189	0.88205	0.71903	0.81728
11	521111	0.2699	0.73010	0.68700	0.62566	0.81412
12	412111	0.2712	0.72879	0.75602	0.67572	0.77609
13	213111	0.2753	0.72465	0.70300	0.68125	0.76423
14	112131	0.2768	0.72323	0.62000	0.63964	0.79364
15	123111	0.2782	0.72182	0.74801	0.63835	0.79233
16	113121	0.3041	0.69594	0.82405	0.63884	0.74763
17	313111	0.3282	0.67181	0.73000	0.62954	0.71148
18	114111	0.3328	0.66721	0.55800	0.58835	0.73769
19	413111	0.3858	0.61423	0.68600	0.55901	0.66666
20	113131	0.3924	0.60759	0.62800	0.50637	0.70034
21	513111	0.4467	0.55326	0.56700	0.47632	0.62774
22	314111	0.4519	0.54811	0.50100	0.48508	0.60964
23	224111	0.4554	0.54461	0.60600	0.46353	0.62338
24	313112	0.4765	0.52351	0.44600	0.47418	0.57239
25	114112	0.4817	0.51832	0.34400	0.44590	0.58998
26	414111	0.5146	0.48545	0.52500	0.41661	0.55484
27	214112	0.5444	0.45563	0.37700	0.40088	0.51147
28	514111	0.5768	0.42324	0.46800	0.34258	0.50821
29	314112	0.6057	0.39431	0.39700	0.34670	0.44402
30	414112	0.6638	0.33615	0.39800	0.28410	0.39252
31	515311	0.6722	0.32780	0.23505	0.22899	0.44475
32	214113	0.6900	0.30998	0.19093	0.24324	0.38578
33	314113	0.7410	0.25903	0.20702	0.20101	0.32676
34	334231	0.7431	0.25693	0.25105	0.16356	0.37943
35	525111	0.7499	0.25011	0.17393	0.18725	0.32554
36	535111	0.7964	0.20359	0.23308	0.13227	0.30022
37	515431	0.8089	0.19108	0.16798	0.11135	0.30828
38	315113	0.8285	0.17150	0.21199	0.12731	0.22706
39	415314	0.9117	0.08835	0.13000	0.05083	0.14931
40	515223	0.9177	0.08234	0.13599	0.05546	0.12057

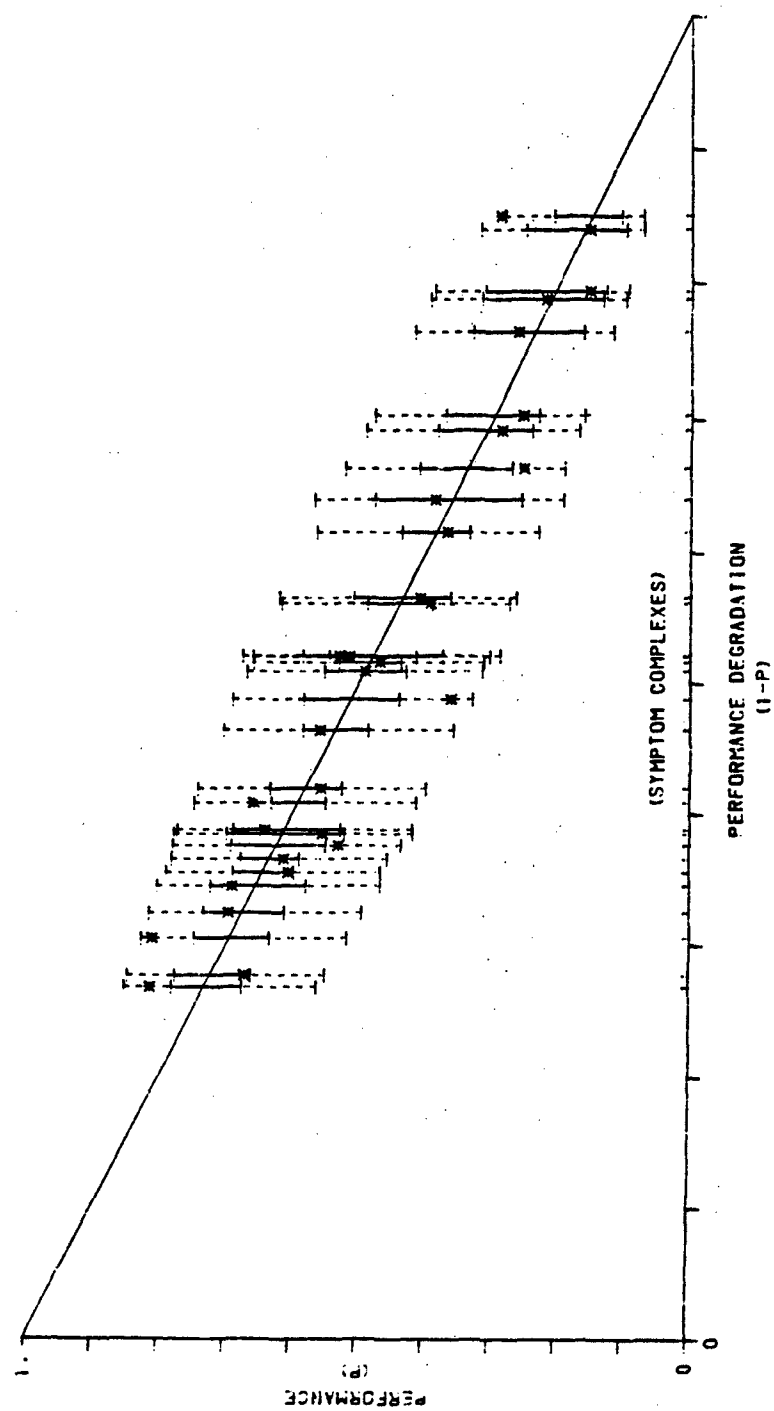


Figure 17. Gun crew individual performance: chief of section.

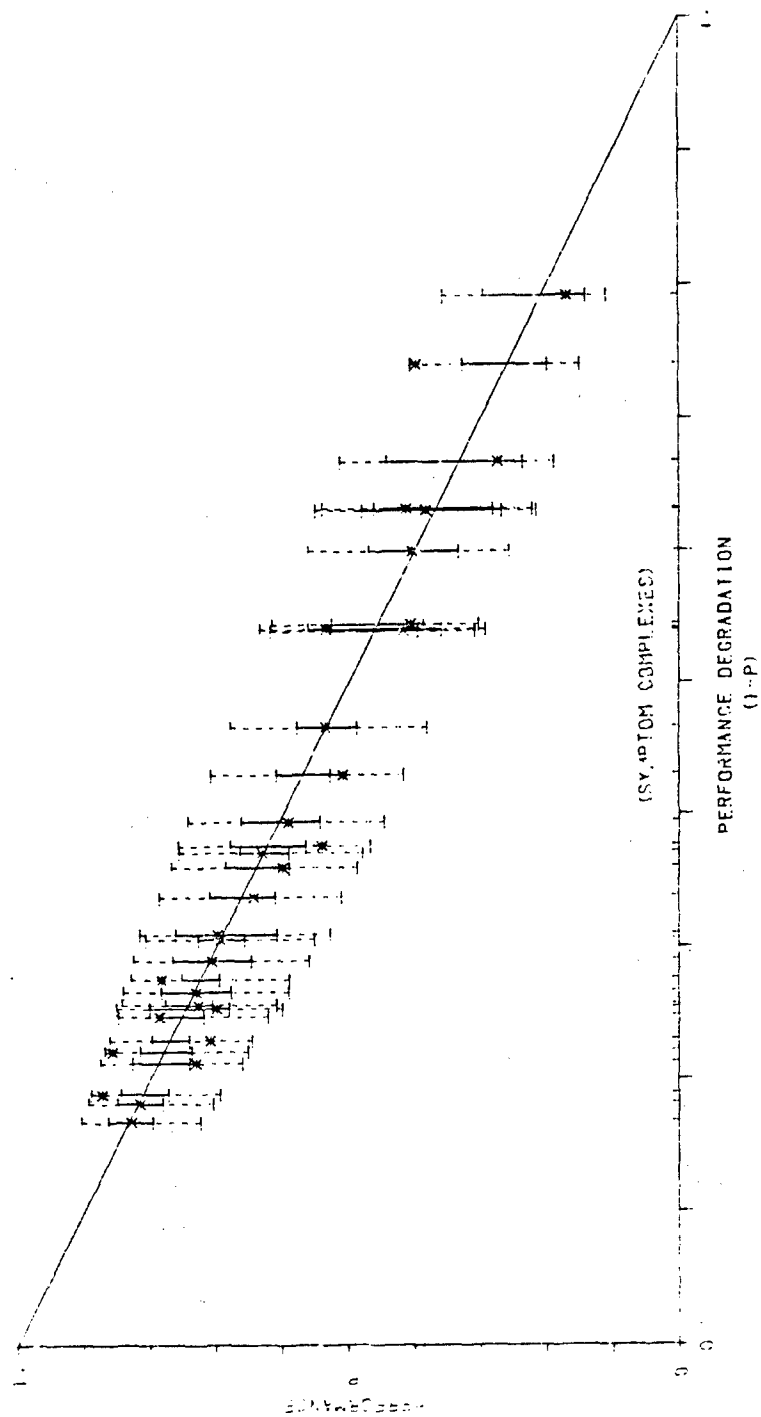


Figure 18. Gun crew individual performance: gunner.

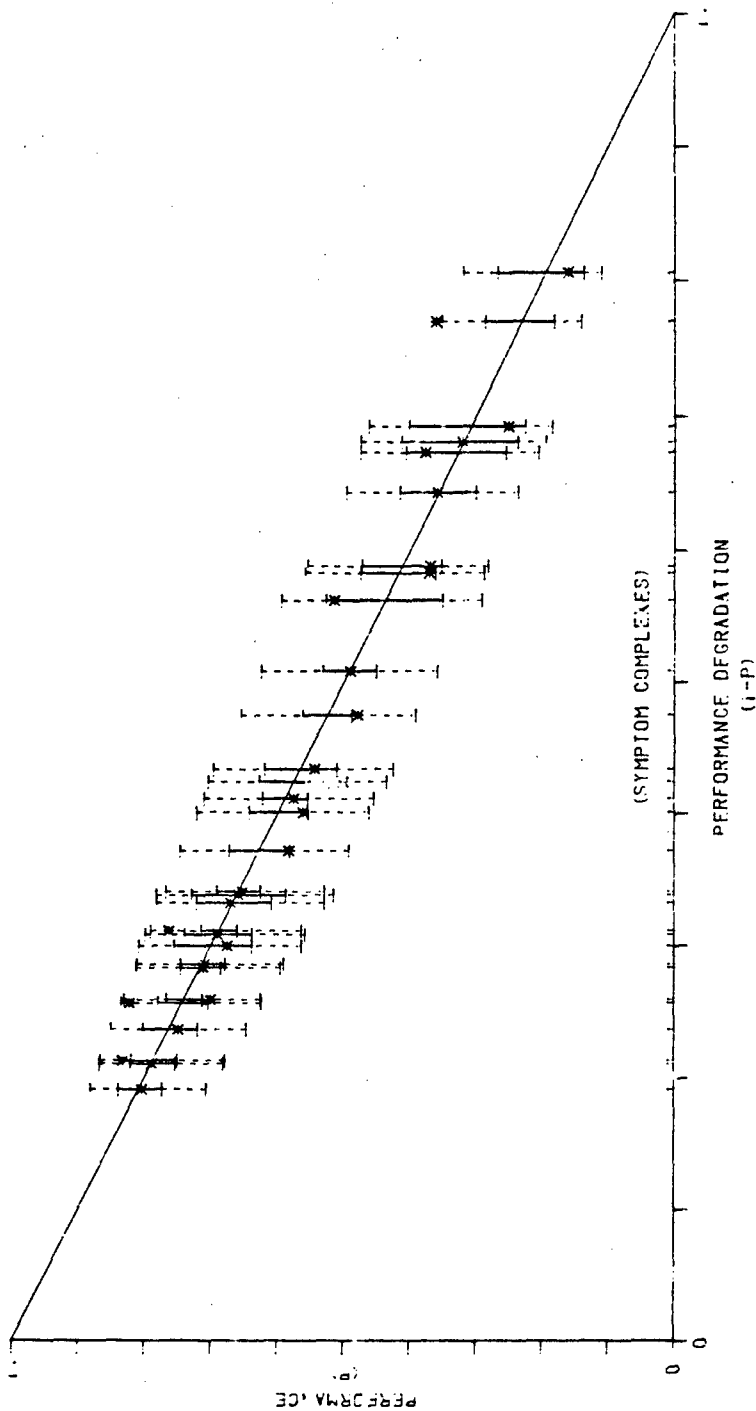


Figure 19. Gun crew individual performance: assistant gunner.

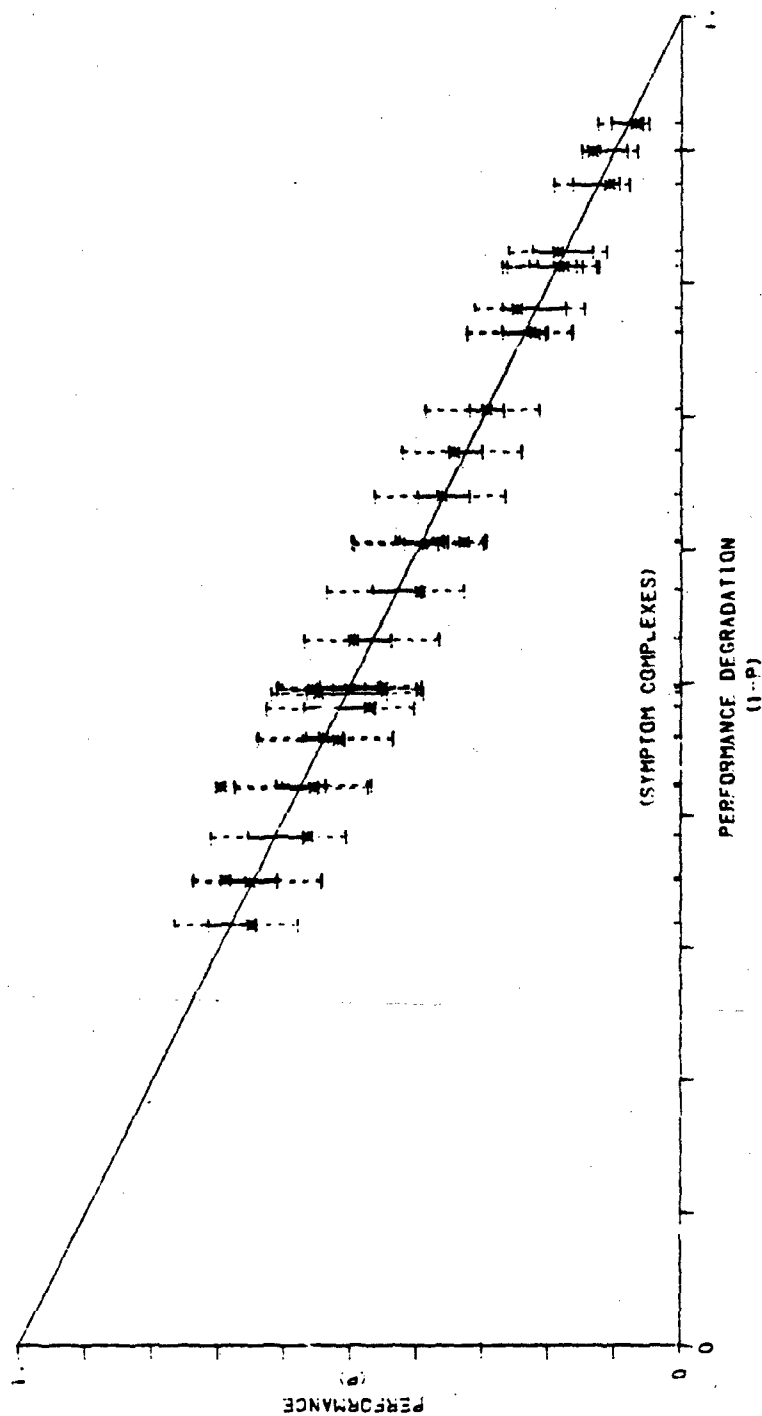


Figure 20. Gun crew individual performance: loader.

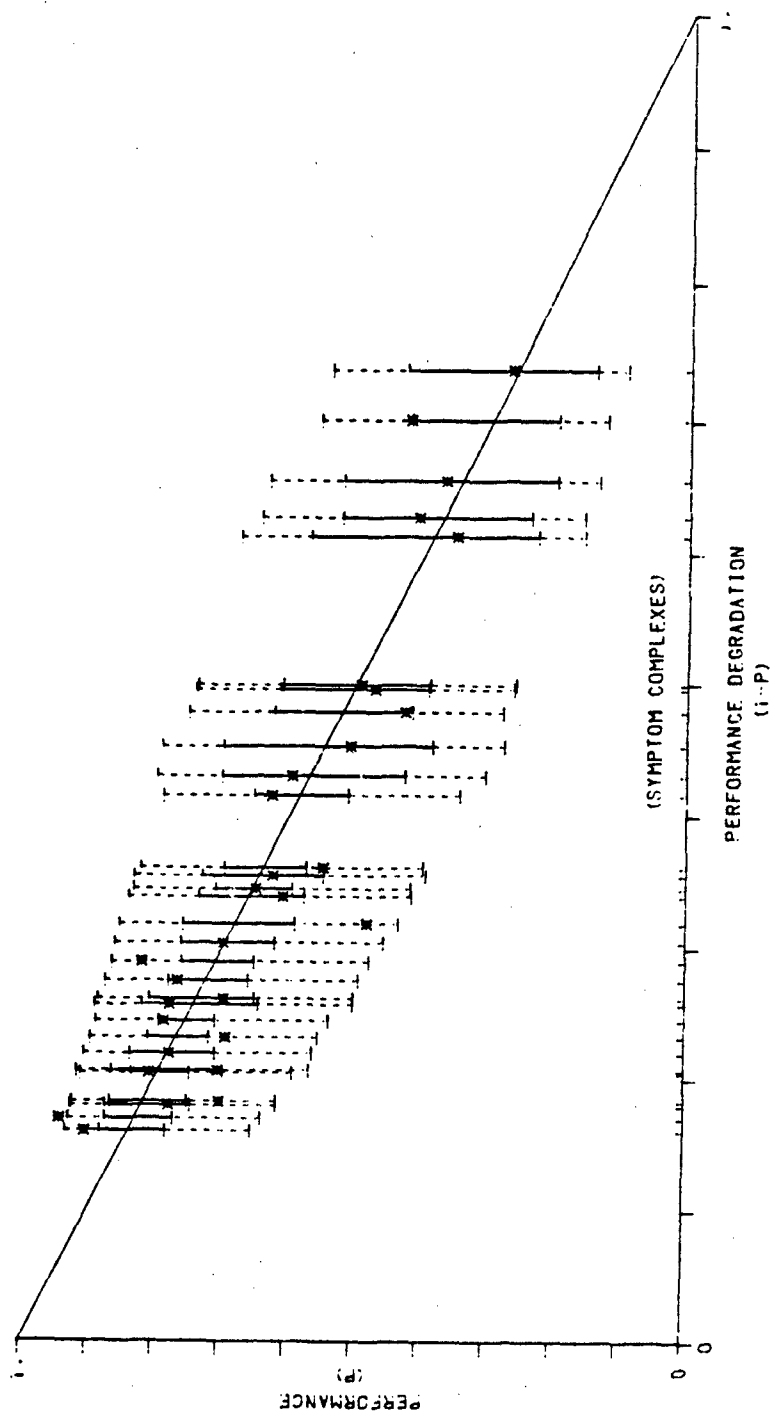


Figure 21. FDC crew individual performance: fire direction officer.

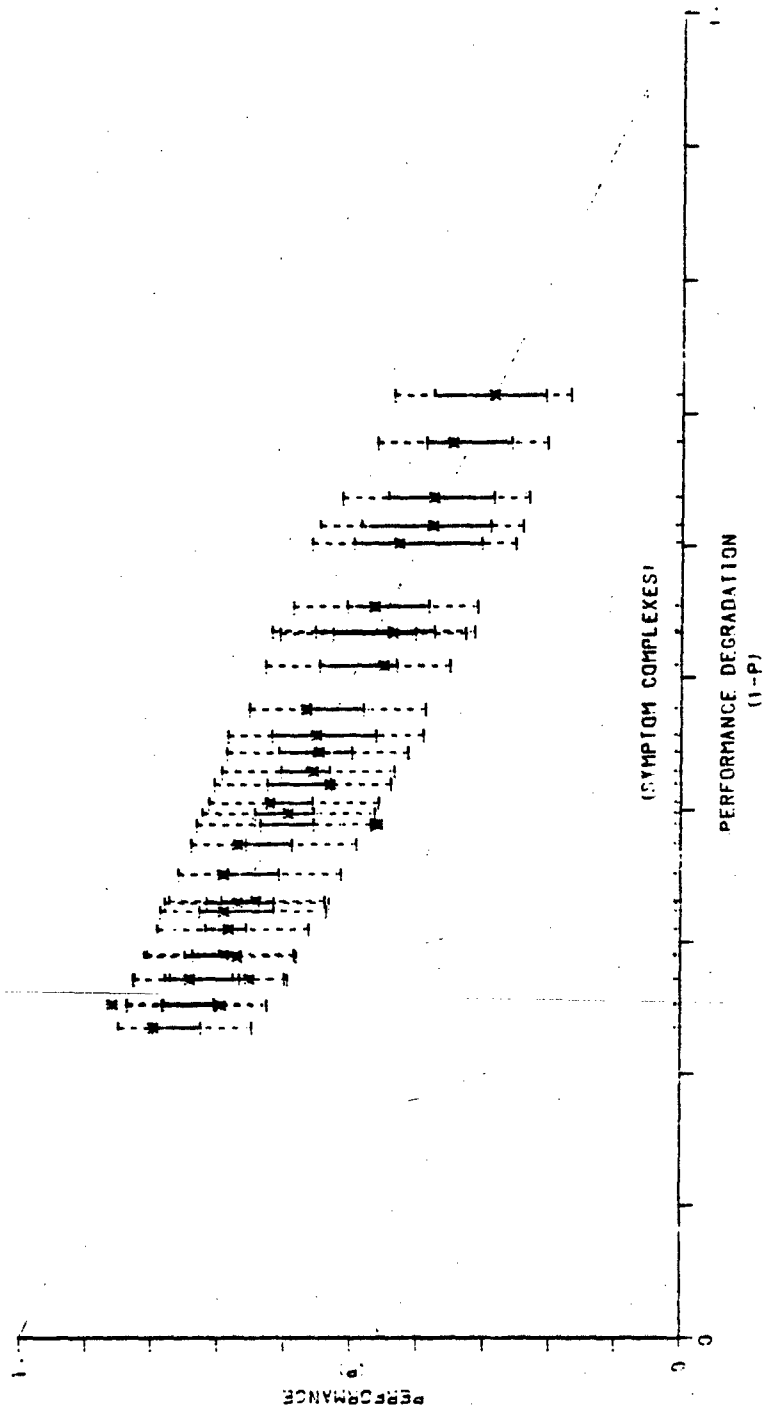


Figure 22. FDC crew individual performance: horizontal control operator.

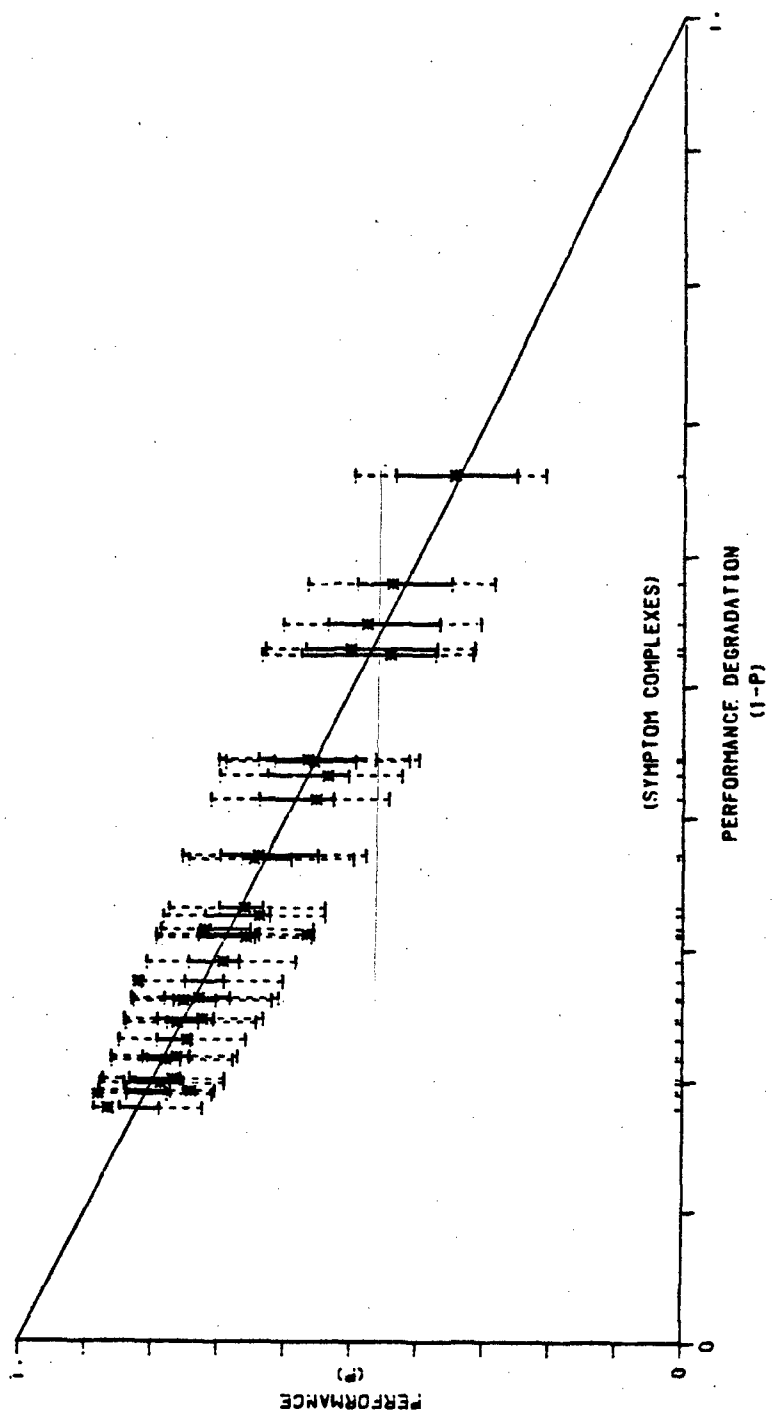


Figure 23. FDC crew individual performance: computer.

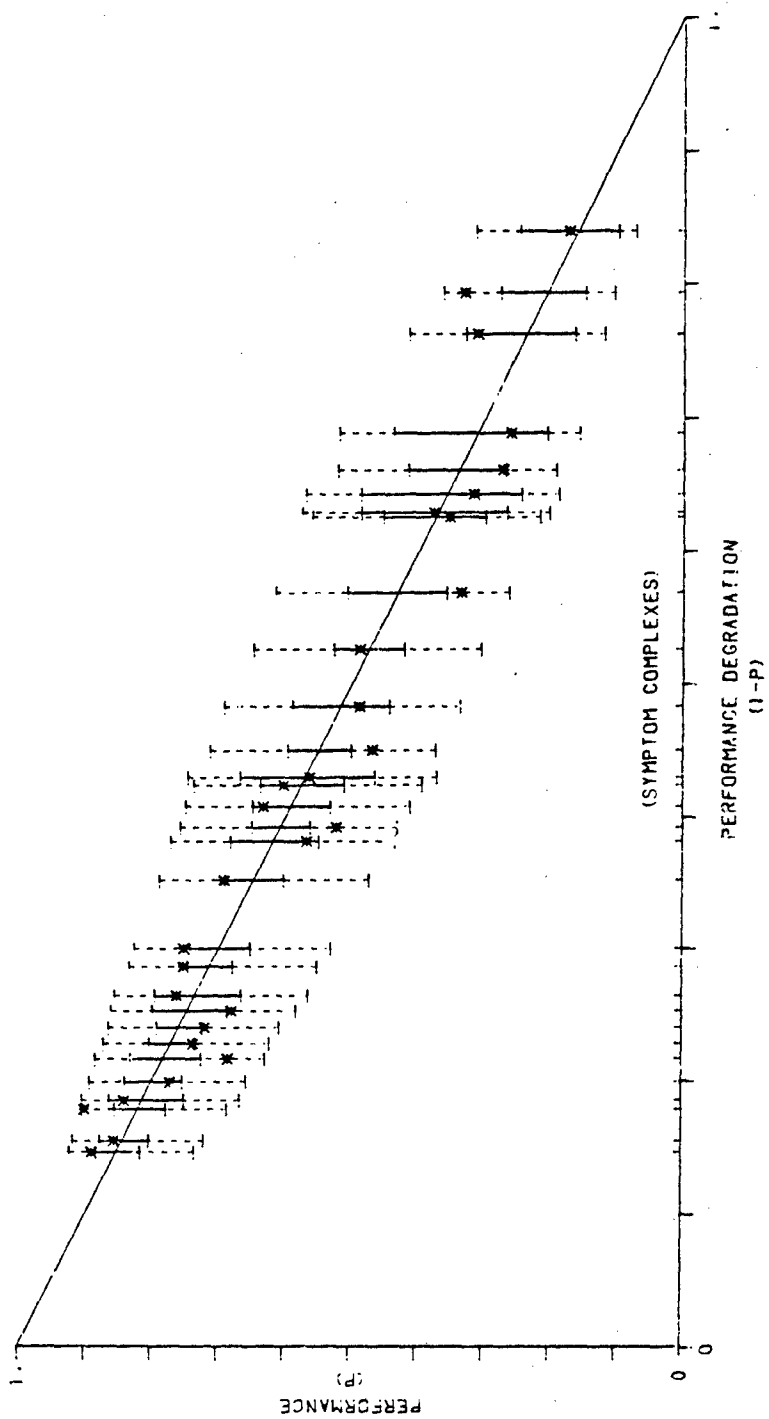


Figure 24. Tank crew individual performance: tank commander.

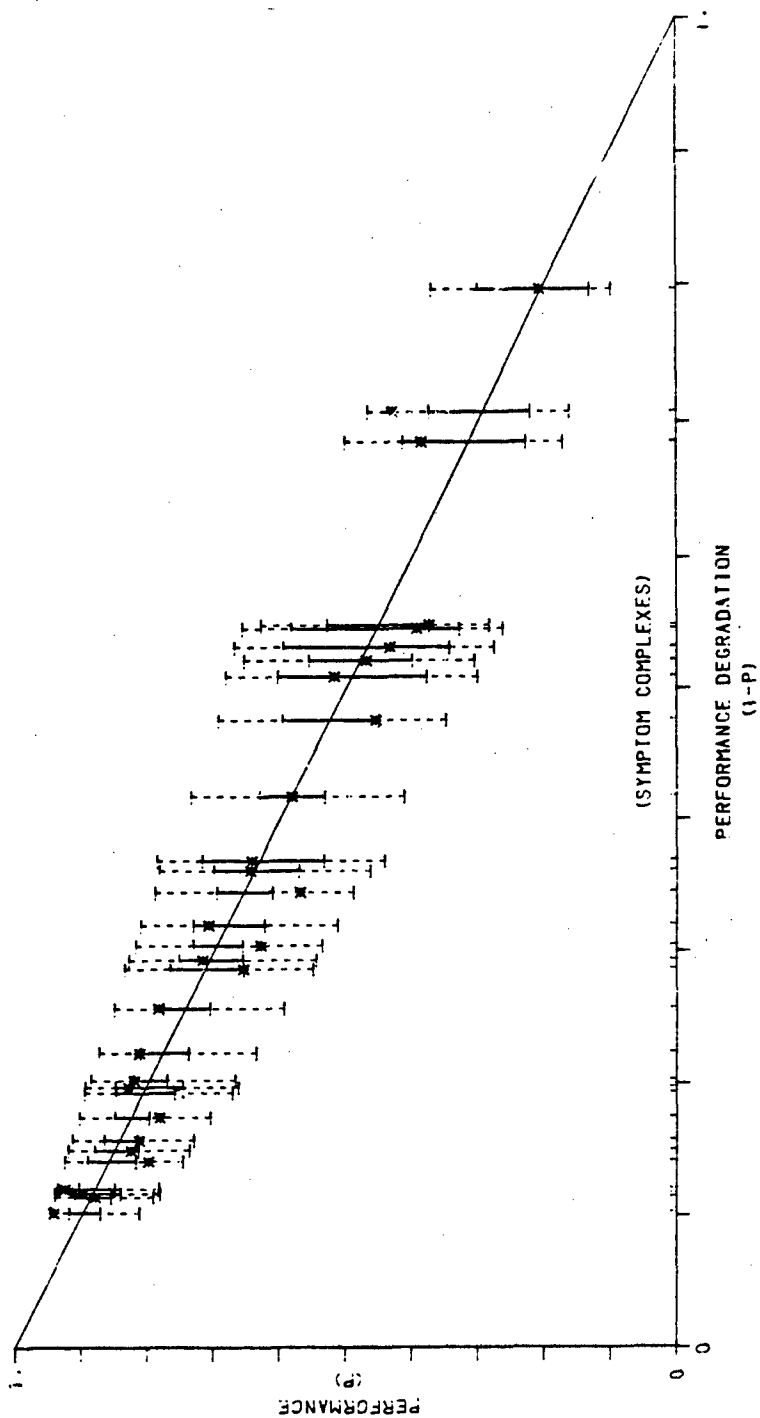


Figure 25. Tank crew individual performance: gunner.

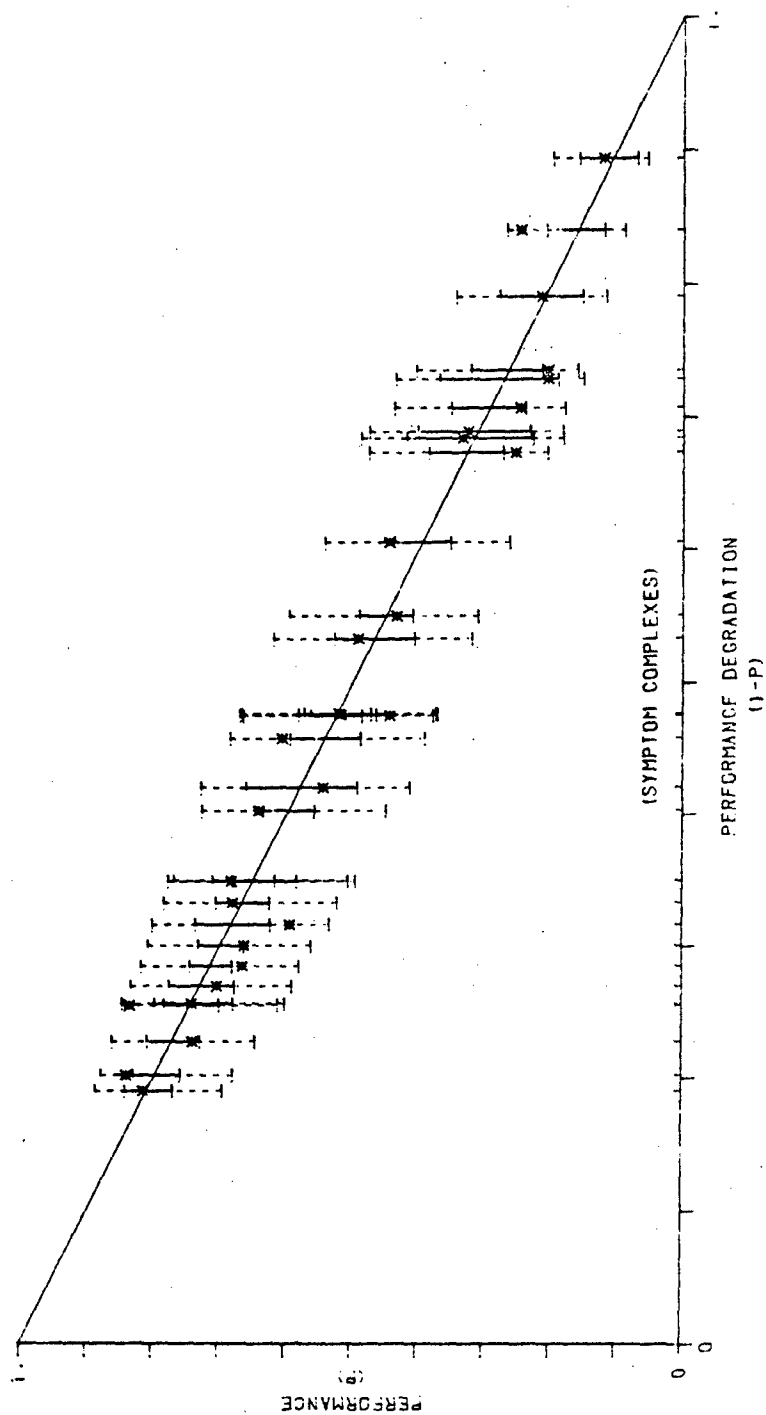


Figure 26. Tank crew individual performance: loader.

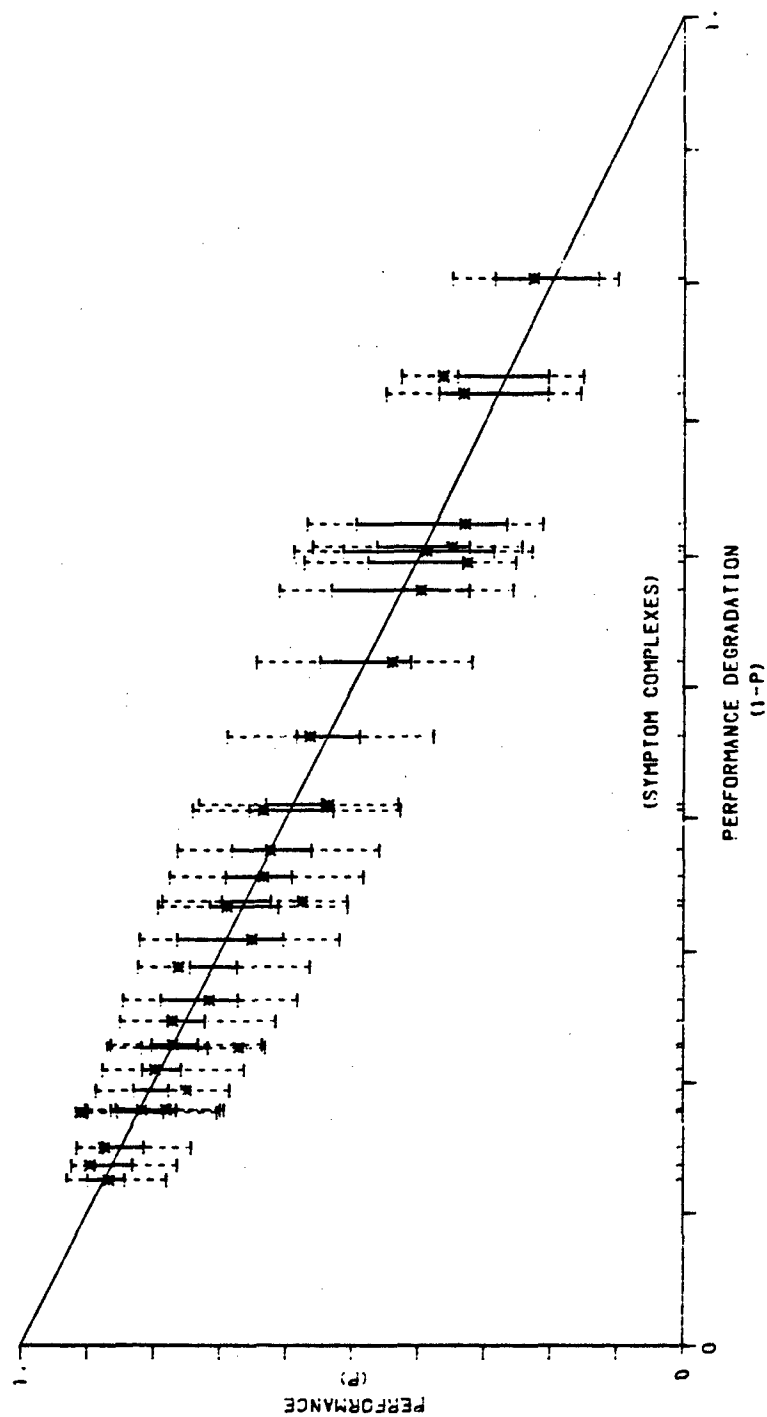


Figure 27. Tank crew individual performance: driver.

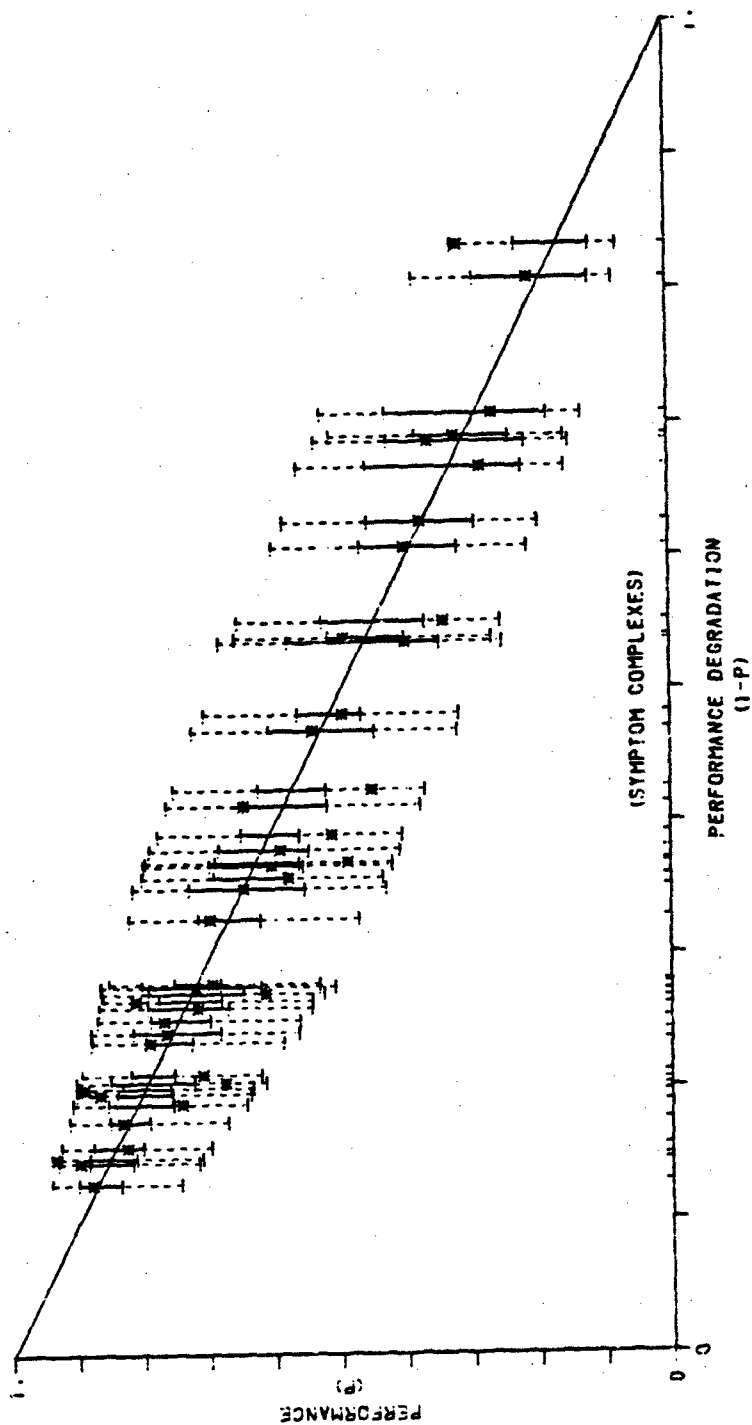


Figure 28. TOW crew individual performance: squad leader.

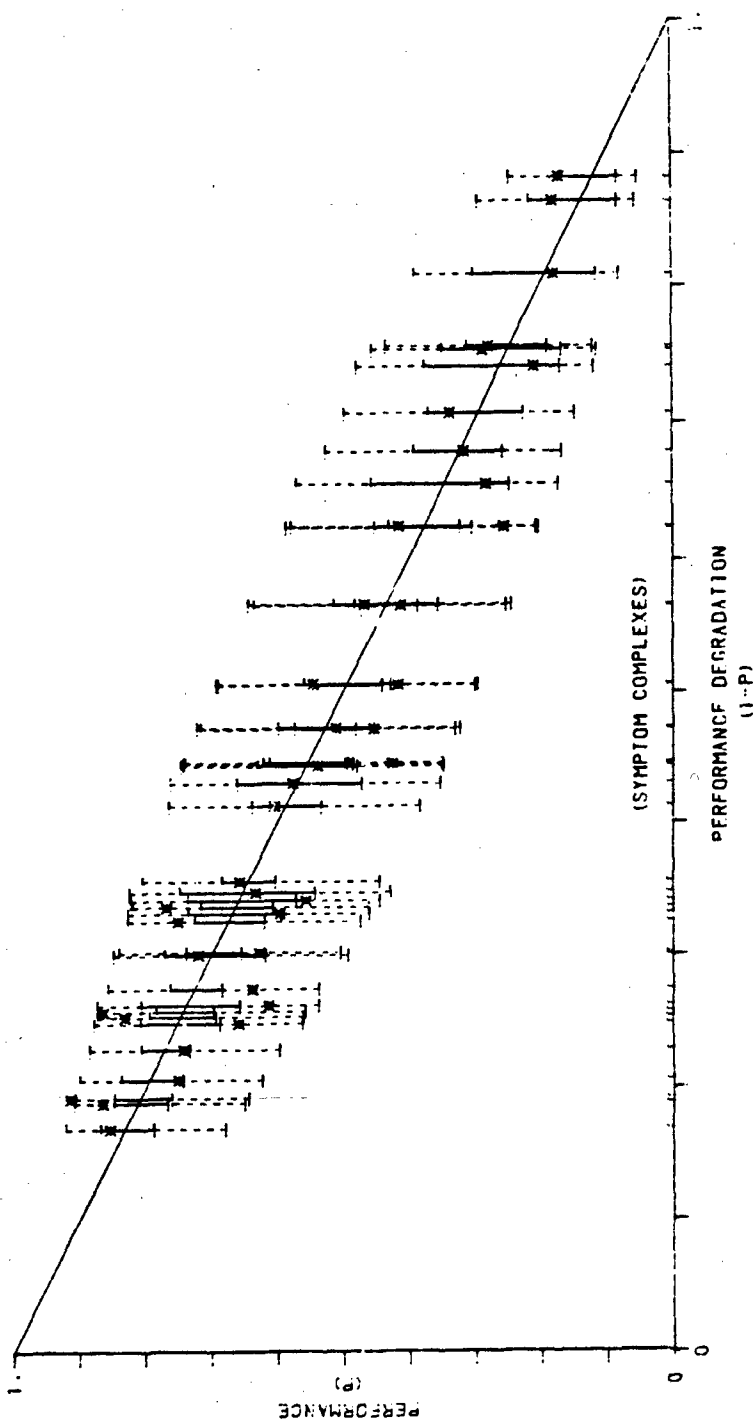


Figure 29. TOW crew individual performance: gunner.

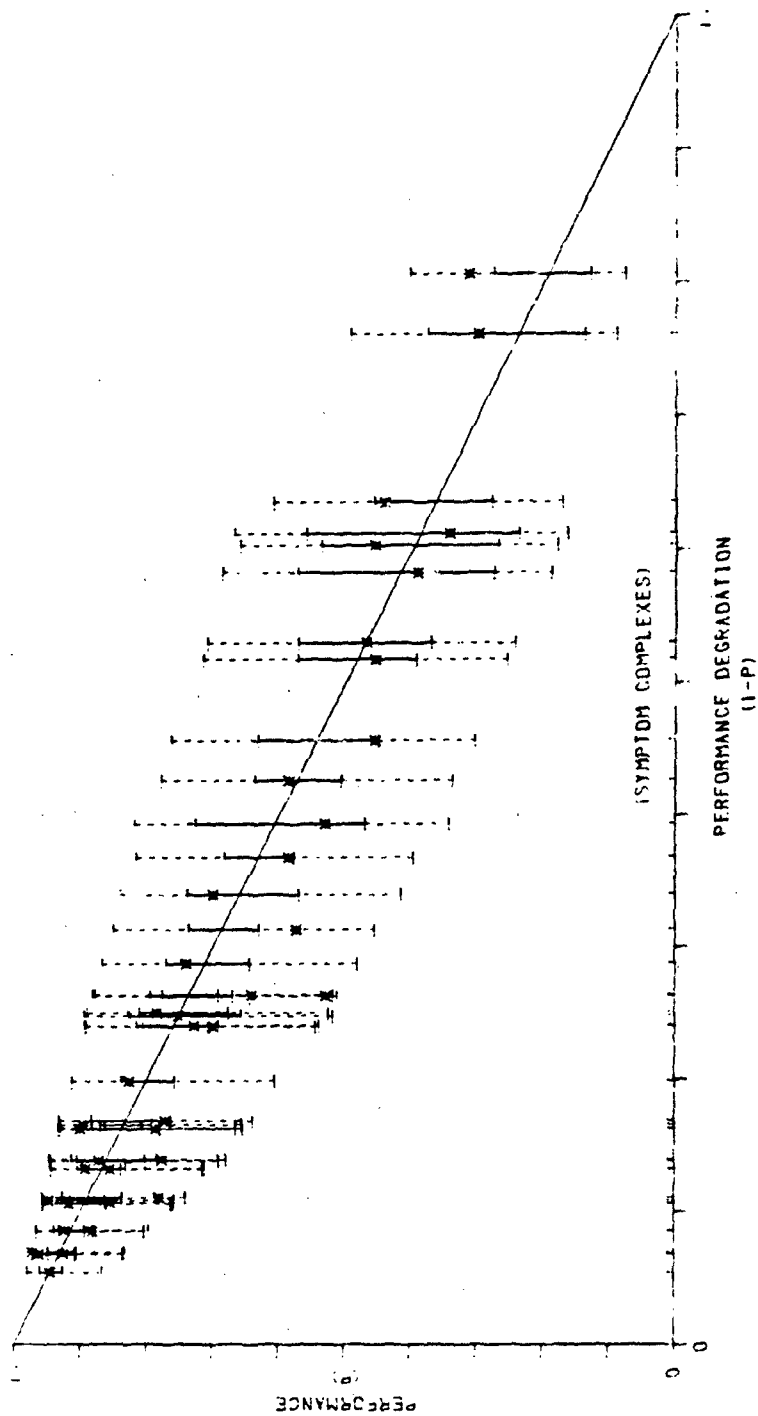


Figure 30. TOW crew individual performance: driver.

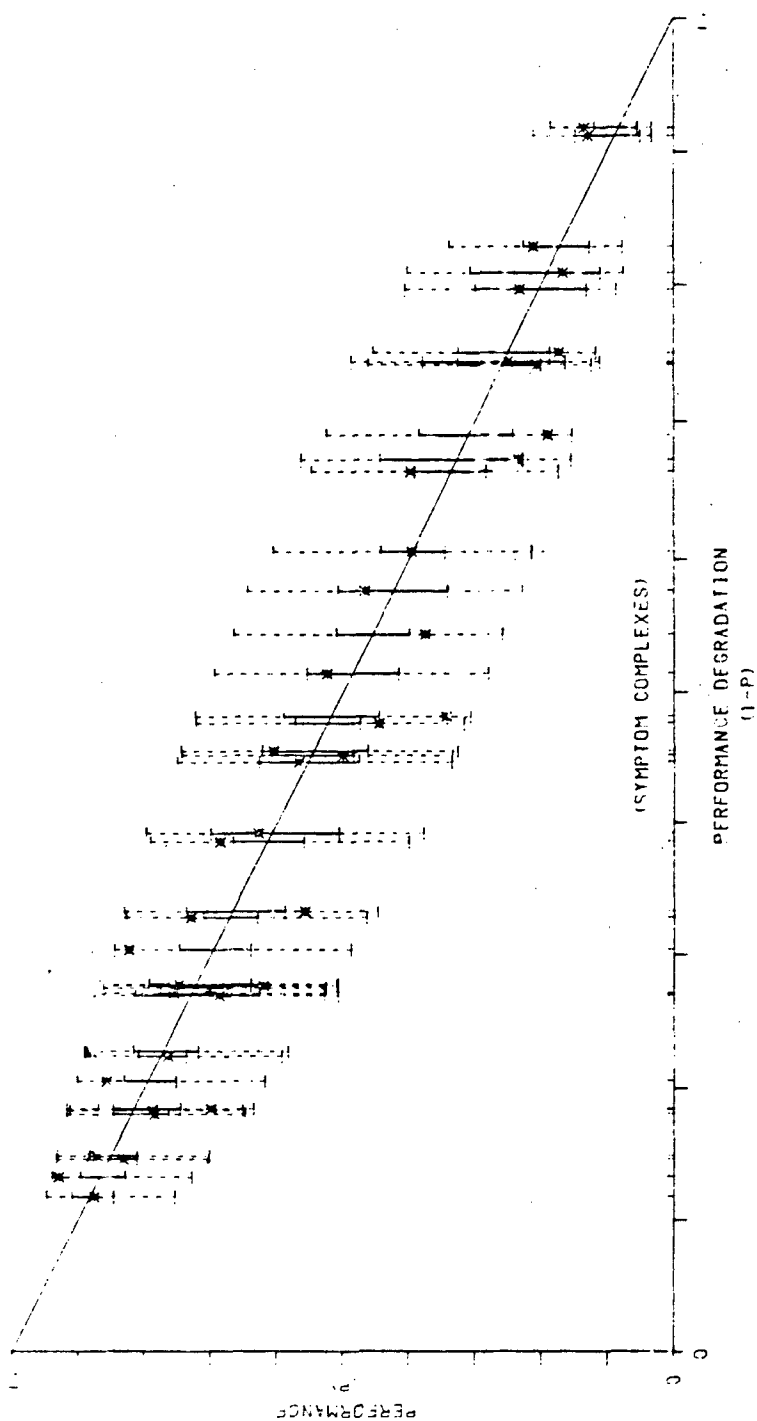


Figure 31. TOW crew individual performance: loader.

The performance plots indicate relative trends for each crew position such as tendencies toward high, low, and middle of clustering responses along the straight line. High and low clustering would indicate skewed distributions, and those tending to cluster toward the middle may indicate a more symmetric distribution. The lowest estimates of performance are provided for the artillery gun crew loader, whose tasks are probably the most physically demanding. On the other hand, the highest estimates of performance are provided for the FDC crew computer position, whose activity is the least physically demanding, consisting wholly of cognitive tasks. Some crewmembers show a near-threshold-like effect even for the most benign symptom complexes where performance drops from 100 to between 70 and 80 percent.

Also noteworthy are the relative widths of the error bar patterns. For example, the gun crew loader plot also shows the narrowest error bar widths, indicating the most consistency in the response data. On the other hand, the fire direction officer plot shows perhaps the widest error bar spread, indicating a relative lack of consistency in the response data.

Differences between input data and regression prediction performance values are seen to occur more frequently for symptom complexes 112111, 113111, 224111, and 515223. Table 28 lists those cases, termed outliers, where the data values lie outside the 95 percent confidence limits of the regression mean value predictions. Data values for complexes 112111 and 113111 are consistently higher than the regression values. Moreover, data values for symptom complex 113111 are consistently, although only slightly higher, than complex 112111. Based on our evaluation of the data (Sec. 2) and this analysis, we are unable to positively explain those differences. However, we point out that the regression analysis served to predict performance for symptom complexes 112111 and 113111 in the order that one would expect, i.e., a lower value of performance for 113111 than for 112111.

In Figs. 17 through 23, symptom complex 224111, for the artillery gun, and FDC crews, is associated with lower values from the data relative to the regression values, whereas symptom complex 515223 is associated with substantially higher values. We are also unable to explain

Table 28. Significant outliers: percentage variation of performance data prediction relative to regression performance prediction.

Crew	Crewmember	Symptom Complex ^a				Performance Data Difference between 224111 and 515223
		112111	113111	224111b	515223b	
Gun	Chief of section	11.0	14.0	-29 (0.36)	92 (0.29)	0.07
	Gunner	--	10.0	-13 (0.54)	54 (0.40)	0.14
	Assistant gunner	--	--	13 (0.50)	57 (0.36)	0.14
	Loader	6.6 ^c	21.0	-16 (0.33)	33 ^c (0.13)	0.20
FDC	Fire direction officer	7.9	14.0	-29 (0.48)	41 ^c (0.42)	0.06
	Horizontal control operator	13.0	29.0	-44 (0.23)	-- (0.22)	0.01
	Computer	5.6	8.9	-17 (0.57)	-- (0.44)	0.13
Tank	Commander	4.3	9.9	-- (0.57)	61 (0.33)	0.24
	Gunner	5.0	5.2 ^c	-- (0.66)	47 (0.43)	0.23
	Loader	5.5 ^c	12.0	-- (0.52)	55 (0.25)	0.27
	Driver	3.8	11.0	-- (0.62)	36 (0.36)	0.26
TOW	Squad leader	5.2 ^c	8.1	-- (0.61)	91 (0.32)	0.29
	Gunner	6.6 ^c	11.0	-- (0.54)	44 ^c (0.17)	0.34
	Driver	3.5	8.9 ^c	-- (0.78)	63 (0.32)	0.45
	Loader	--	14.0	-- (0.61)	65 ^c (0.14)	0.47

^a Negative values indicate data values less than regression values.

^b Data predictions are in parentheses.

^c Indicates near upper 95 percent confidence limit.

these differences based on the treatment of the data. However, we do observe that the spread (given in the last column of Table 28) in data performance values between complexes 224111 and 515223 given for the gun and FDC crews (parenthetical values in Table 28) appears narrow given the differences in the severity levels of the two complexes. A wider spread in values as predicted by the regression relationship seems more reasonable considering the two complexes.

In addition to the crewmember positions, regression analyses were performed for the separate tasks under each crew position, using the task response data given in Appendix E. Results of predicted task performance are graphically compared with predicted position performance in Appendix G. The regression parameters for task performance prediction are also listed in tables given in Appendix G.

The regression analysis described in this section serves to develop performance input data for further extending individual crewmember performance to dose and time based on the numerical procedures described in Sec. 5. After improvements were made to the army questionnaire raw data discussed in Sec. 2, performance data were analyzed and prepared for mapping onto the dose/time framework developed in Sec. 4. Section 5 then describes the process of joining the individual crewmember performance data with the dose and time variables to develop the performance dose/time relationships.

SECTION 4

DOSE/TIME SYMPTOM COMPLEXES

In this section, we build a framework for expressing the performance prediction estimates of Sec. 3 as a function of dose and time. Using time-dependent symptom profiles, a dose/time structure is developed, which consists of discrete regions that represent the various symptom complexes. From the symptomatology descriptions of the acute radiation syndromes in humans (developed from actual case experience of irradiated individuals [Baum et al., 1983]), time-dependent profiles are constructed to typify the symptom severity for each of eight subdivisions of the intermediate dose range [75 to 4500 rads (cGy)*] [Anno and Wilson, 1983]. Time boundaries are assigned to the symptom complexes according to symptom severity level. Finally, the symptom complex areas are joined for each of the eight dose ranges--according to dose--to form a dose/time map of symptom complexes.

Figures 32 through 39 plot symptom severity level against the logarithm of postexposure time for each of eight free-in-air dose ranges [75-150, 150-300, 300-530, 530-830, 830-1100, 1100-1500, 1500-3000, and 3000-4500 rads (cGy)] for the six symptom categories developed in Baum et al. [1983]; those categories are as follows:

1. Upper gastrointestinal distress (UG).
2. Lower gastrointestinal distress (LG).
3. Fatigability and weakness (FW).
4. Hypotension (HY).
5. Infection, bleeding, and fever (IB).
6. Fluid loss and electrolyte imbalance (FL).

The severity profiles developed in Anno and Wilson [1983] for each of the six symptom categories are represented in the figures by the "curves" formed by the connected sloping and parallel straight lines. The curves are also shown as step functions where vertical lines connect

*One centigray (cGy) is equal to one rad.

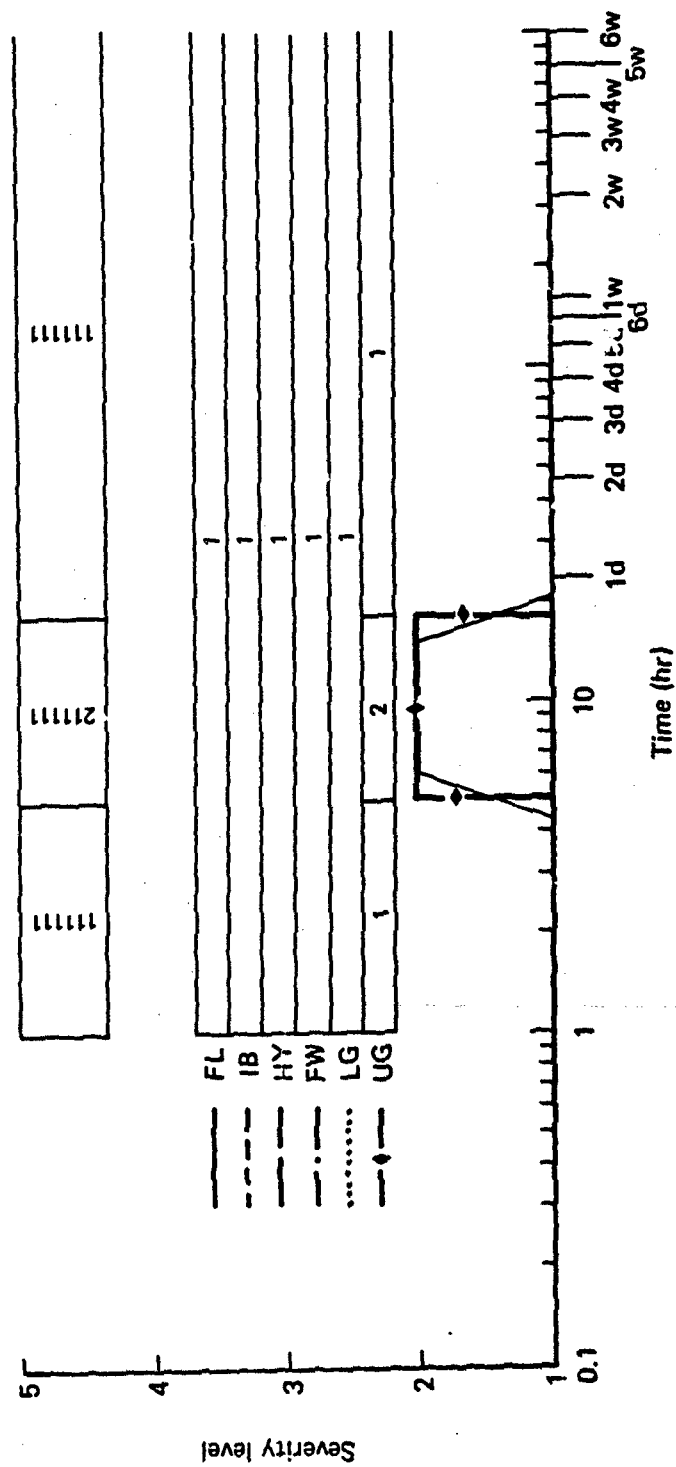


Figure 32. Symptom severity level: 75 to 150 rads (cGy) free-in-air dose.

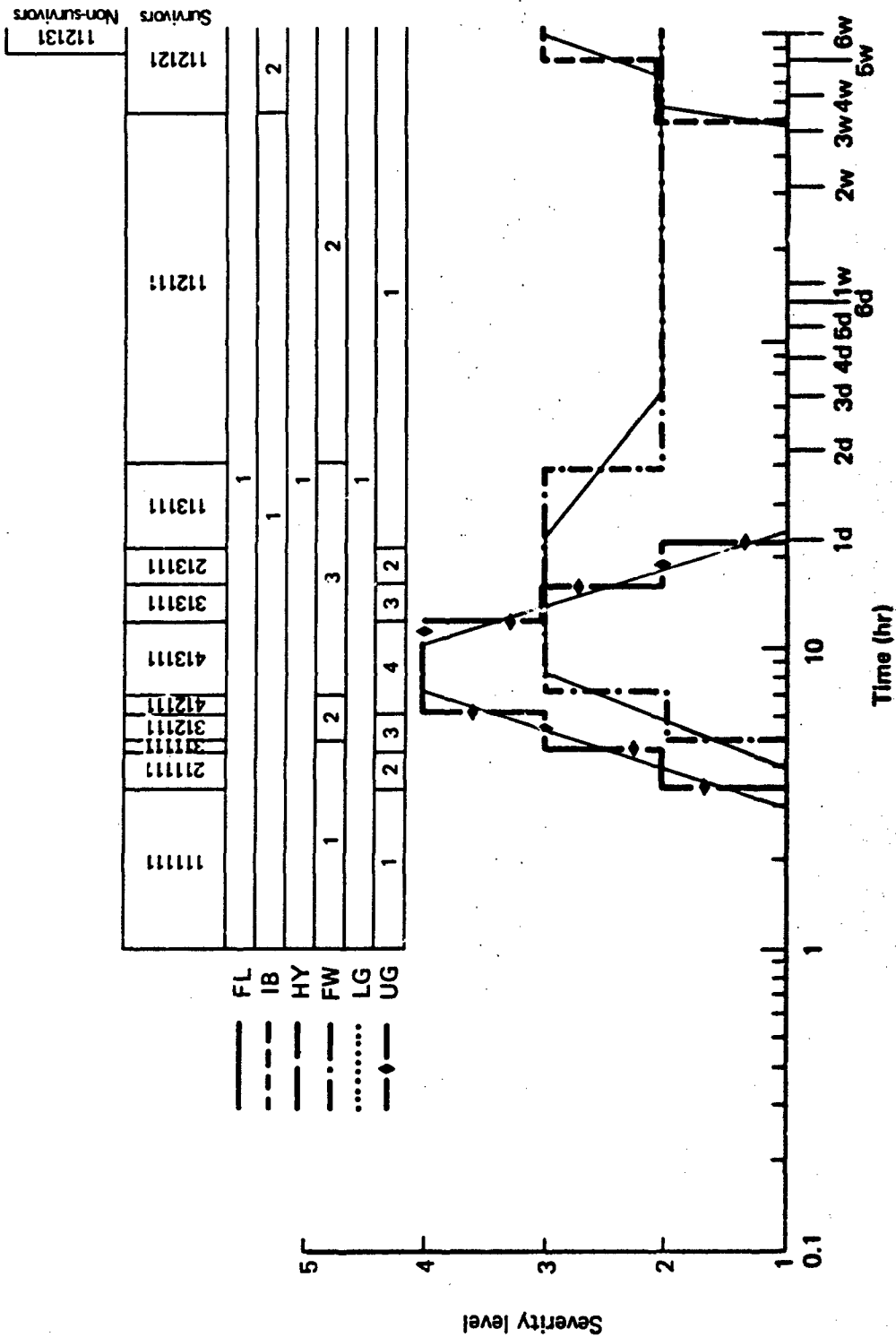
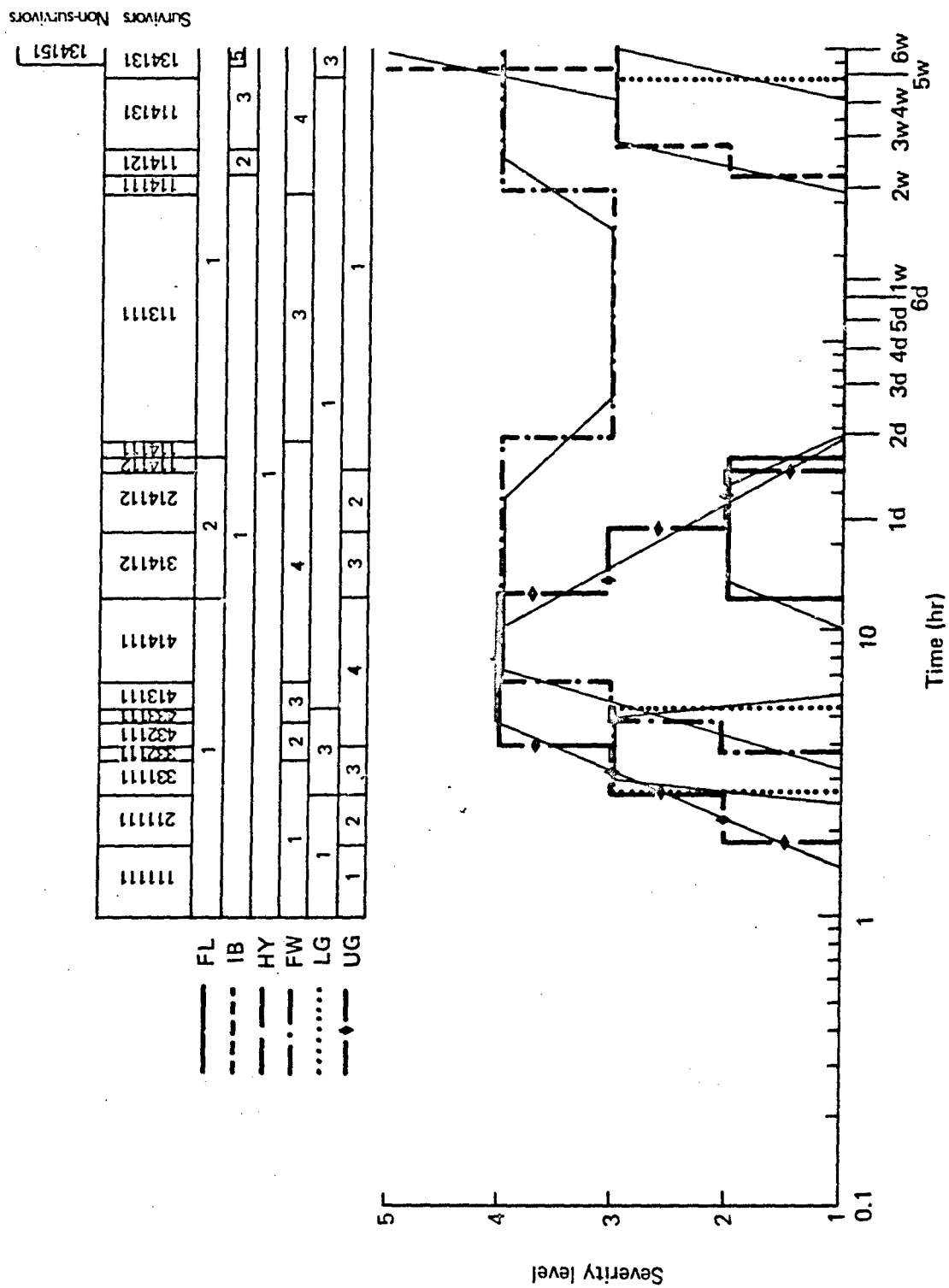


Figure 33. Symptom severity level: 150 to 300 rads (cGy) free-in-air dose.



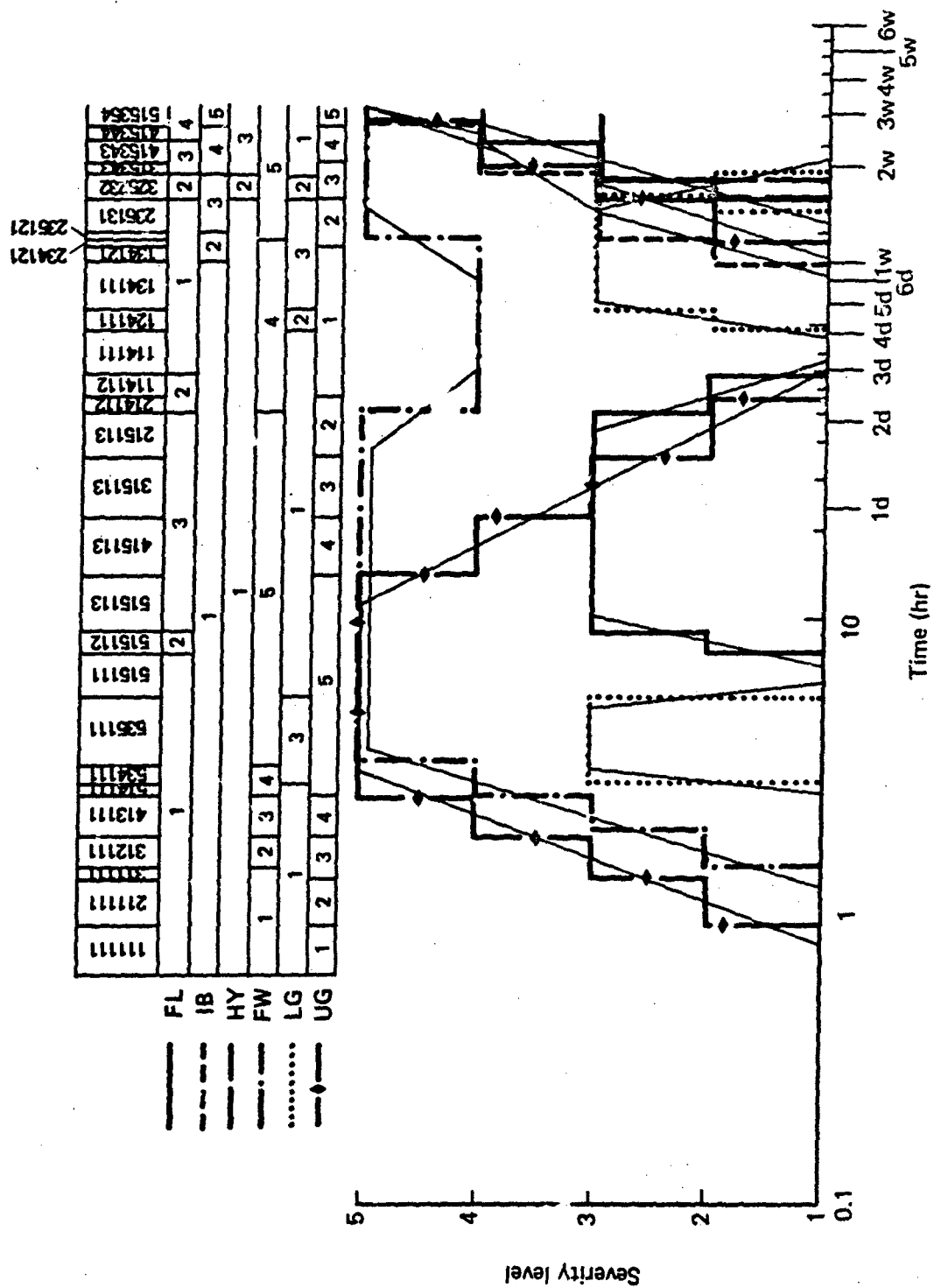


Figure 36. Symptom severity level: 830 to 1100 rads (cGy) free-in-air dose.

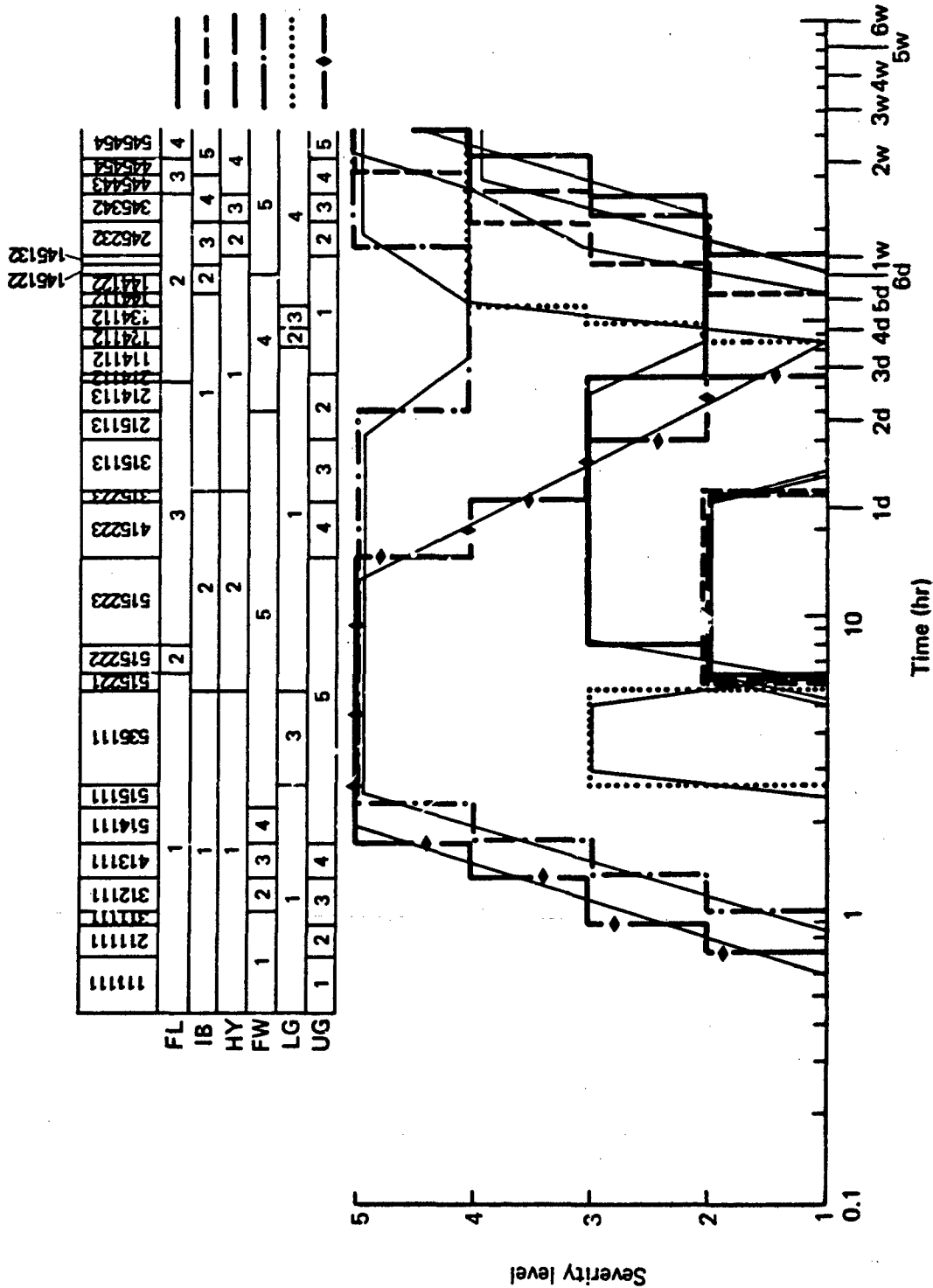


Figure 37. Symptom severity level: 1100 to 1500 rads (cGy) free-in-air dose.

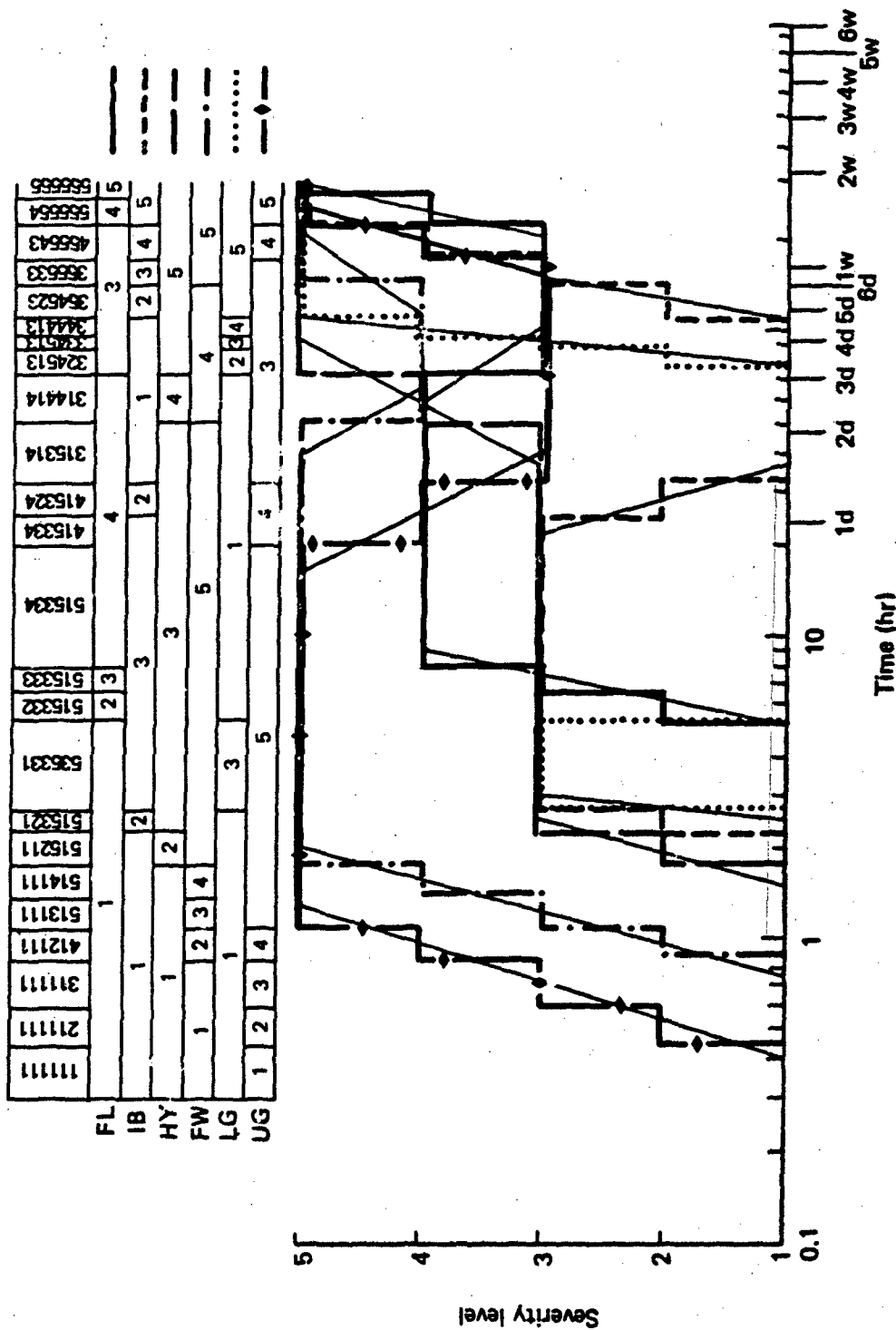


Figure 38. Symptom severity level: 1500 to 3000 rads (cGy) free-in-air dose.

the levels. Thus, symptom severity is represented in terms of discrete levels consistent with the formation of the severity level descriptions in Anno and Wilson [1983]. The step function profiles are constructed such that approximately equal areas under the sloping curves are maintained.

Above those curves, each of the symptom categories is shown as a horizontal band spanning time and is divided into a series of rectangles of varying length. The symptom category bands contain integers that designate the severity level and associated time period. Above the group of rectangles is another band that defines the symptom complexes in terms of a six-digit code. Those coded rectangles merely "collapse" the separate bands of each of the six symptom categories depicted below them into the symptom complexes. The position of each digit in the code corresponds to one of the six symptom categories shown earlier, and in the order indicated. However, the *value* of each individual digit indicates the severity level of each symptom category.

For example, in Fig. 34, for the dose range 300 to 530 rads (cGy), symptom complex 314112, existing between 13 and 22 hr following exposure, consists of symptom categories in the following order: upper gastrointestinal distress (UG), severity level 3; lower gastrointestinal distress (LG), level 1; fatigability and weakness (FW), level 4; hypotension (HY), level 1; infection, bleeding, and fever (IB), level 1; and fluid loss and electrolyte imbalance (FL), level 2. The description for this symptom complex [Anno and Wilson, 1983] used in the army combat crew questionnaire [Glickman et al., 1983] is as follows: "Nauseated, considerable sweating, swallows frequently to avoid vomiting; very tired and weak; thirsty and has dry mouth, weak and faint."

Except for the early LG distress, we estimate that all other symptom categories represented by the symptom severity profiles in Figs. 32 through 39 are applicable to about 50 percent (except for the 75 to 150 rads [cGy] dose range) or more of those irradiated, and are thus typically representative. The profile for LG distress, shown by a dotted line between 2.5 and 5.5 hr in Figs. 34 through 39, is a brief one- or two-time episode of diarrhea that may occur in the early or prodromal phase following radiation exposure in about 10 percent of those irradiated up to a dose of about

1500 rads (cGy). That threshold may increase to a maximum of about 30 percent up to a dose of 4500 rads (cGy). Since our focus in this report is on the effects on performance of the "typical" acute radiation syndrome and symptom sequelae, we have omitted the *early* LG effect from the main calculations of performance for typical combat crewmembers as a function of dose and time. However, additional calculations have been made that do take the early LG effect into account (see Appendix H).

At the extreme ends of Figs. 33, 34, and 35, two sets of symptom complexes are indicated at corresponding or similar times to reflect the possible sequelae of "survivors" and "nonsurvivors." In Fig. 33, for the 150 to 300 rad (cGy) dose range, a small number of lethalties, less than or equal to about 5 percent, may be expected to occur sometime after the fifth week following exposure [Baum et al., 1983]. Accordingly, we have represented the nonsurvivors by complex 112131 as the offset rectangle. In Fig. 34, for the 300 to 530 rad (cGy) dose range, up to 50 percent lethalties may be expected sometime after the fourth week following exposure [Baum et al., 1983]. Similarly, we have represented nonsurvivors by symptom complex 134151 as the offset rectangle. However, in Fig. 35 for the 530 to 830 rad (cGy) dose range, 50 to 99 percent lethalties may be expected starting at the end of the third week following exposure [Baum et al., 1983]. In that case the survivors, rather than the nonsurvivors, are represented by the offset rectangles containing symptom complex designations.

Figure 40 gives the dose/time locations of all the symptom complexes. The symptom complexes in the upper band of rectangles in Figs. 33 through 39, for each of the eight dose ranges, are combined. The percent (incidence) of individuals expected to have acute radiation symptoms represented by the symptom complexes are indicated by dose range to the left of the ordinate [Baum et al., 1983]. The various complexes typify expected states of acute radiation sickness following a prompt period of exposure. However, since each complex is composed of six different symptomatic components, it is not a straightforward matter to quantify each in terms of an overall state or condition measured on some uniform scale. This is because we cannot stipulate the degree of severity level equivalence or symptom dependence across the symptom categories. It is

possible, however, to indicate where severe conditions such as debilitation and lethality can be expected. In Fig. 40 the dark shaded areas indicate the occurrence of lethality. Although not shown in the figure, possibly a small number of lethalties may occur after 5 weeks for the 150 to 300 rad (cGy) dose range. The lightly shaded areas indicate severe debilitation ranging from shock, prostration, and fainting at the high dose ranges to infection, fever, weakness, and exhaustion at the low dose ranges.

The severe conditions (debilitation and lethality) indicated in Fig. 40 are where the radiobiological considerations alone suggest extreme functional impairment and are therefore useful to guide the development of performance boundary conditions to combine with the performance estimates from the regression analysis estimates. Figure 40 provides the dose/time framework for the numerical performance mapping process described in Sec. 5, which follows.

SECTION 5

DOSE/TIME PERFORMANCE MAPPING

In the last section, a dose/time framework of symptom complexes was constructed; here, the quantitative relationship of crewmember performance with dose and postexposure time is established. The procedure consists of a one-to-one numerical mapping of crewmember performance values obtained from the regression analysis onto the dose/time framework of symptom complexes. Through numerical methods described below, we extend the input performance values from the regression analysis (Sec. 3), ranging from 0 to 100 percent, to produce output performance surfaces and isoperformance contour levels as a function of dose and postexposure time. The discussion that follows details the procedure and lists the numerical values used to obtain the performance dose/time output relationship.

INPUT DATA

Performance values developed from the regression analysis of the combat crew questionnaire responses, together with the appropriate dose and time values, constitute the basic input data. The crew questionnaire responses on which the regression analysis is based do not correspond to all symptom complexes indicated in Fig. 41, owing to a limitation on the number of symptom complexes allowed in the combat crew questionnaires [Glickman et al., 1983]. However, a substantial portion of the dose/time domain, shown by the lightly shaded areas, corresponds to the symptom complexes where questionnaire response data were obtained.

Table 29 lists the input values used for the dose/time performance mapping. For each dose range, the symptom complexes, time ranges, times, and corresponding performance predictions from the regression analysis are given. The performance values are for the chief of section of the gun crew, as a generic case, although the same input format holds for all crew positions (see Appendix I). Graphically, the time range values correspond to the time boundaries of the symptom complex rectangles shown

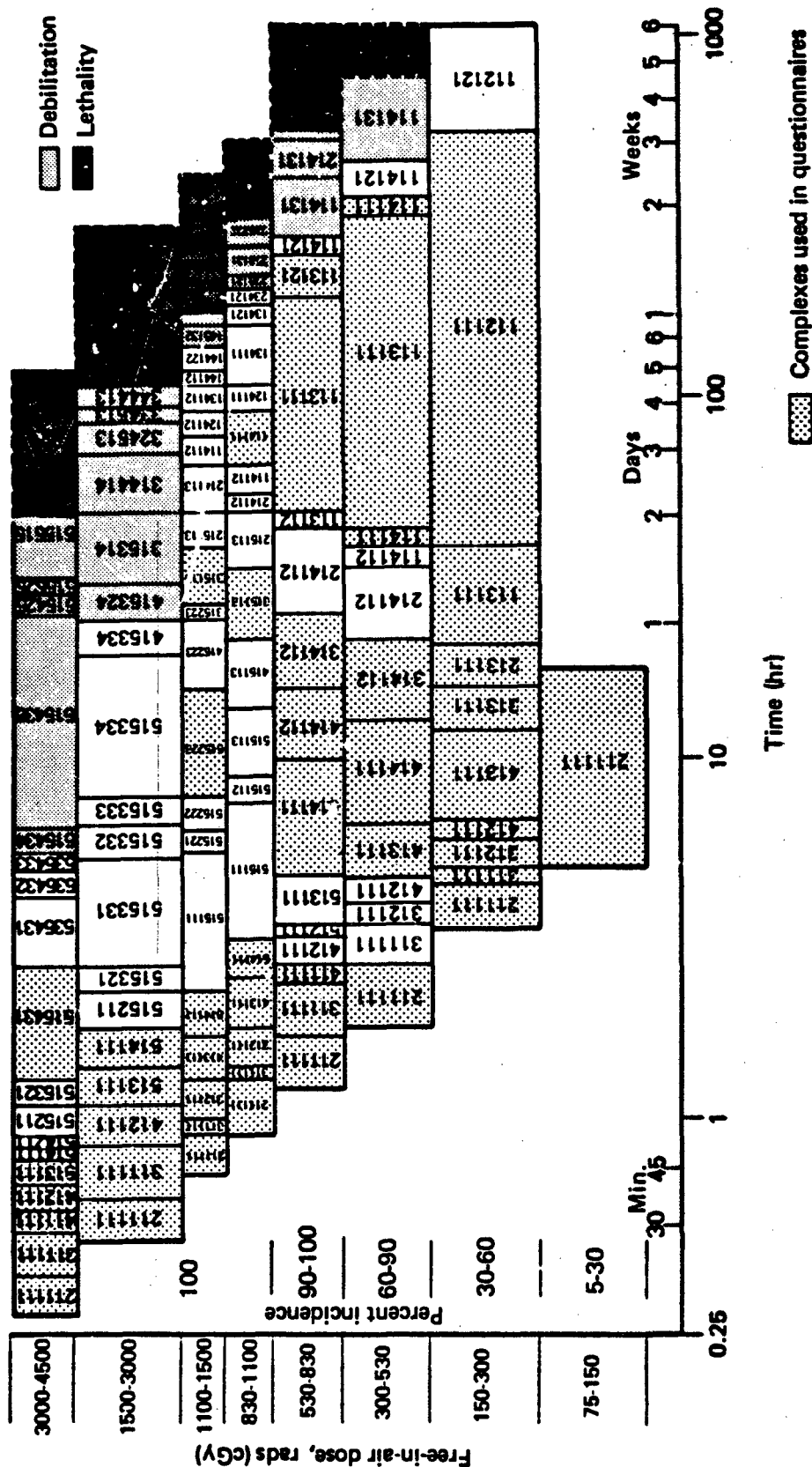


Figure 41. Symptom complexes including those from questionnaires.

in Fig. 41. The time value where performance input is specified is the midpoint of the horizontal length of those rectangles. Since the time axis is logarithmic, the midpoint is given by the square root of the product of the time boundaries.

Referring to Fig. 41, input boundary conditions are specified at the outer periphery of the connected collection of symptom complex areas. This is done by specifying the performance with a series of relationships described below that designate where the performance is 100 percent (symptom-free) or assumed to be 0 percent (extreme symptom severity or lethality).

COMPUTATIONAL PROCEDURE

In order to create a three-dimensional representation of performance as a function of dose and time, we take the symptom map (Fig. 41) plus imposed boundary conditions to build a smooth surface that both covers the regions of interest and passes through each performance input data point. To do this, a "french curve" algorithm (FCA) is used to translate the input data into an evenly spaced (logarithmic) grid of performance predictions for 18 values of dose and 39 values of time.

We chose the particular dose/time grid structure to allow full resolution of the underlying symptom map without adding an excessive amount of easily interpolated information. Within the areas defined by boundary conditions there are 143 irregularly spaced input points and about 400 output values. Since the only regularities in the structure of the input data are the 8 dose bands, the dose grid lines are chosen to correspond to the middle of the bands to the extent possible. No such regularity is present in the time structure of the input data, so the grid lines are chosen for calculational convenience.

Figure 42 shows the output grid structure, along with the locations assigned to the input data and the imposed boundaries. The dose grid lines are indexed i , where $i = 1, 2, \dots, 18$, which correspond to dose values listed in Table 30, given by

$$D_i = 10^{(0.11i+1.67609)} \text{ rads (cGy)} \quad (21)$$

Table 29. Input data for dose/time analysis of gun crew, chief of section.

Dose Range [rads (cGy)]	Complex	Time Range (hr)		Time (hr)	Performance Value for Input Data
75-150	211111	5.00	18.00	9.49	0.7226
150-300	211111	3.40	4.50	3.91	0.7226
	311111	4.50	5.00	4.74	0.6751
	312111	5.00	6.00	5.48	0.6341
	412111	6.00	6.80	6.39	0.5804
	413111	6.80	12.00	9.03	0.5357
	313111	12.00	16.00	13.86	0.5912
	213111	16.00	21.00	18.33	0.6444
	113111	21.00	40.00	28.98	0.6943
	112111	40.00	540.00	146.97	0.7314
	112121	540.00	1060.00	756.57	0.6568
300-530	211111	1.80	2.70	2.20	0.7226
	311111	2.70	3.50	3.07	0.6751
	312111	3.50	3.90	3.69	0.6341
	412111	3.90	4.60	4.24	0.5804
	413111	4.60	6.60	5.51	0.5357
	414111	6.60	13.00	9.26	0.4904
	314112	13.00	22.00	16.91	0.4386
	214112	22.00	35.00	27.75	0.4947
	114112	35.00	40.00	37.42	0.5510
	114111	40.00	45.00	42.43	0.6545
	113111	45.00	320.00	120.00	0.6943
	114111	320.00	360.00	339.41	0.6545
	114121	360.00	450.00	402.49	0.5712
	114131	450.00	780.00	592.45	0.4836
	134131	780.00	1080.00	917.82	0.3108
530-830	211111	1.20	1.70	1.43	0.7226
	311111	1.70	2.40	2.02	0.6751
	411111	2.40	2.70	2.55	0.6238
	412111	2.70	3.25	2.96	0.5804
	512111	3.25	3.50	3.37	0.5246
	513111	3.50	4.80	4.10	0.4793
	514111	4.80	10.00	6.93	0.4343
	414112	10.00	16.00	12.65	0.3840
	314112	16.00	26.00	20.40	0.4386
	214112	26.00	45.00	34.21	0.4947
	113112	45.00	50.00	47.43	0.5953
	113111	50.00	190.00	97.47	0.6943
	113121	190.00	250.00	217.95	0.6149
	114121	250.00	280.00	264.58	0.5712
	114131	280.00	410.00	338.82	0.4836
	214131	410.00	520.00	461.74	0.4276

Table 29. Input data for dose/time analysis of gun crew,
chief of section (Continued).

Dose Range [rads (cGy)]	Complex	Time Range (hr)		Time (hr)	Performance Value for Input Data
530-830 (cont.)	314133	520.00	630.00	572.36	0.2000
	424133	630.00	760.00	691.95	0.1216
	434143	760.00	910.00	831.62	0.0633
	444153	910.00	1080.00	991.36	0.0319
830-1100	211111	0.90	1.30	1.08	0.7226
	311111	1.30	1.40	1.35	0.6751
	312111	1.40	1.80	1.59	0.6341
	4. 3111	1.80	2.50	2.12	0.5357
	514111	2.50	3.20	2.83	0.4343
	515111	3.20	7.60	4.93	0.3904
	515112	7.60	9.00	8.27	0.2932
	515113	9.00	14.00	11.22	0.2118
	415113	14.00	22.00	17.55	0.2519
	315113	22.00	35.00	27.75	0.2968
	215113	35.00	50.00	41.83	0.3460
	214112	50.00	56.00	52.91	0.4947
	114112	56.00	67.00	61.25	0.5510
	114111	67.00	92.00	78.51	0.6545
	124111	92.00	110.00	100.60	0.5680
	134111	110.00	160.00	132.66	0.4771
	134121	160.00	180.00	169.71	0.3908
	234121	180.00	190.00	184.93	0.3386
	235121	190.00	200.00	194.94	0.2992
	235131	200.00	260.00	228.04	0.2309
	325232	260.00	320.00	288.44	0.1730
	315343	320.00	360.00	339.41	0.1138
	415343	360.00	410.00	384.19	0.0930
	414344	410.00	460.00	434.28	0.0622
	515354	460.00	520.00	489.08	0.0359
1100-1500	211111	0.70	0.90	0.79	0.7226
	311111	0.90	1.00	0.95	0.6751
	312111	1.00	1.30	1.14	0.6341
	413111	1.30	1.70	1.49	0.5357
	514111	1.70	2.30	1.98	0.4343
	515111	2.30	5.30	3.49	0.3904
	515221	5.30	5.70	5.50	0.2965
	515222	5.70	8.00	6.75	0.2144
	515223	8.00	16.00	11.31	0.1502
	415223	16.00	25.00	20.00	0.1814
	315223	25.00	27.00	25.98	0.2174
	315113	27.00	40.00	32.86	0.2968
	215113	40.00	50.00	44.72	0.3460
	214113	50.00	66.00	57.45	0.3881

Table 29. Input data for dose/time analysis of gun crew,
chief of section (Continued).

Dose Range [rads (cGy)]	Complex	Time Range (hr)		Time (hr)	Performance Value for Input Data
1100-1500 (cont.)	114112	66.00	80.00	72.66	0.5510
	124112	80.00	92.00	85.79	0.4600
	134112	92.00	110.00	100.60	0.3715
	144112	110.00	120.00	114.89	0.2909
	144122	120.00	140.00	129.61	0.2238
	145132	140.00	160.00	149.67	0.1446
	245232	160.00	210.00	183.30	0.1121
	345342	210.00	260.00	233.67	0.0622
	445443	260.00	300.00	279.29	0.0311
	454454	300.00	340.00	319.37	0.0120
	545454	340.00	420.00	377.89	0.0115
1500-3000	211111	0.45	0.60	0.52	0.7726
	311111	0.60	0.84	0.71	0.6751
	412111	0.84	1.10	0.96	0.5804
	513111	1.10	1.40	1.24	0.4793
	514111	1.40	1.80	1.59	0.4343
	515211	1.80	2.30	2.03	0.3748
	515321	2.30	2.70	2.49	0.2829
	515331	2.70	5.40	3.82	0.2171
	515332	5.40	6.60	5.97	0.1523
	515333	6.60	8.00	7.27	0.1042
	515334	8.00	20.00	12.65	0.0701
	415334	20.00	24.00	21.91	0.0863
	415324	24.00	32.00	27.71	0.1184
	315314	32.00	50.00	40.00	0.1932
	314414	50.00	72.00	60.00	0.2118
	324513	72.00	86.00	78.69	0.2123
	334513	86.00	96.00	90.86	0.1576
	344413	96.00	110.00	102.76	0.1218
	354523	110.00	140.00	124.10	0.0596
	355533	140.00	170.00	154.27	0.0358
3000-4500	455543	170.00	220.00	193.39	0.0204
	555554	220.00	270.00	243.72	0.0000
	555555	270.00	300.00	284.61	0.0000
	211111	0.28	0.36	0.32	0.7226
	311111	0.36	0.48	0.42	0.6751
	411111	0.48	0.56	0.52	0.6238
	412111	0.56	0.66	0.61	0.5804
	513111	0.66	0.77	0.71	0.4793
	514111	0.77	0.84	0.80	0.4343
	514211	0.84	0.90	0.87	0.4181
	515211	0.90	1.10	0.99	0.3748

Table 29. Input data for dose/time analysis of gun crew,
chief of section (Concluded).

Dose Range [rads (cGy)]	Complex	Time Range (hr)		Time (hr)	Performance Value for Input Data
3000-4500 (cont.)	515321	1.10	1.30	1.20	0.2829
	515431	1.30	2.70	1.87	0.2061
	535431	2.70	4.20	3.37	0.1111
	535432	4.20	5.00	4.58	0.0749
	535433	5.00	5.60	5.29	0.0498
	515434	5.60	6.60	6.08	0.0659
	515435	6.60	26.00	13.10	0.0437
	515425	26.00	30.00	27.93	0.0610
	515525	30.00	33.00	31.46	0.0573
	515515	33.00	55.00	42.60	0.0796
	535515	55.00	70.00	62.05	0.0400
	555515	70.00	91.00	79.81	0.0197
	555525	91.00	110.00	100.05	0.0139
	555535	110.00	120.00	114.89	0.0000

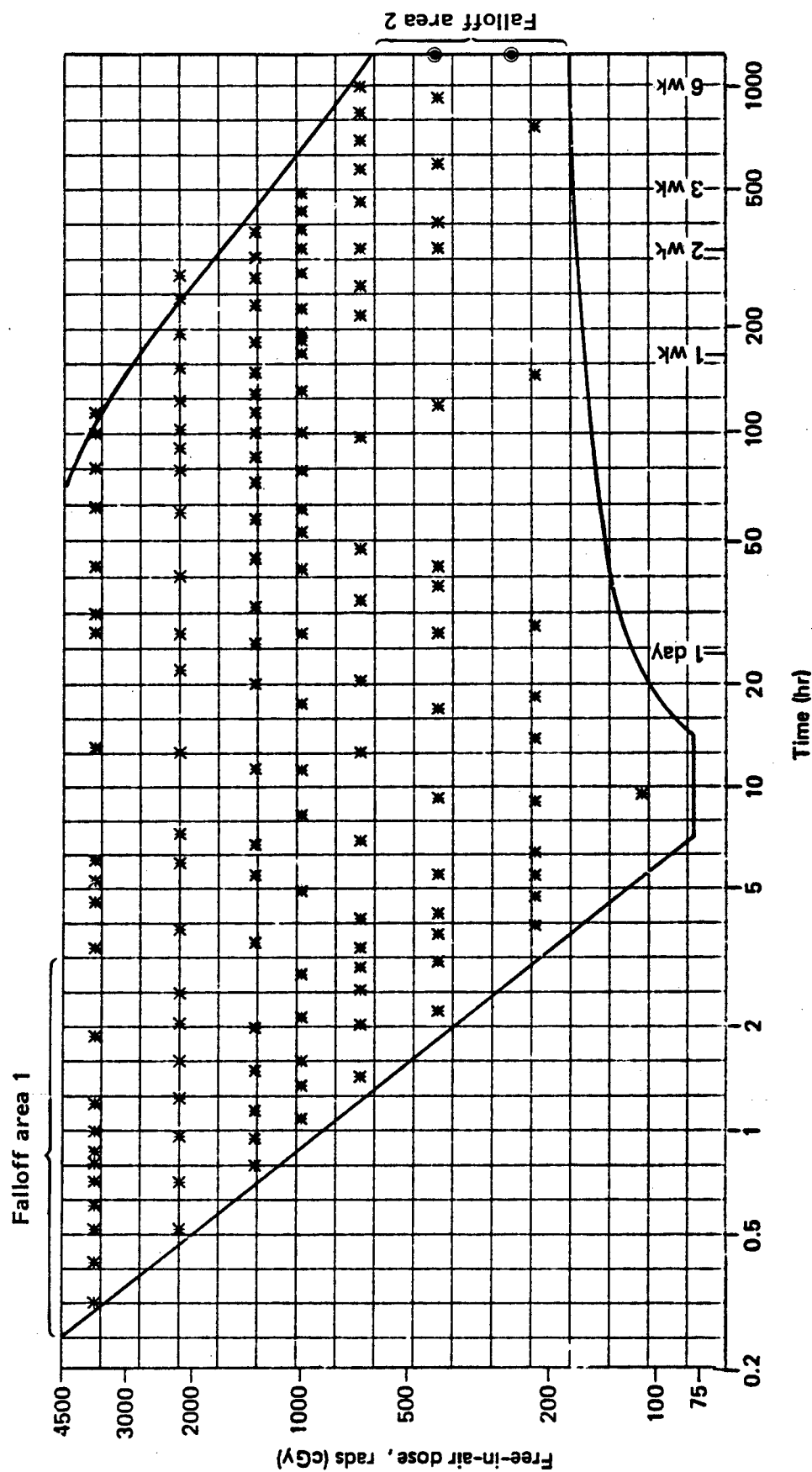


Figure 42. Data points and boundaries.

Table 30. Dose/time grid lines.

Range [rads (cGy)]	Dose (free-in-air)		Time			
	Index (i)	Grid Line [rads (cGy)]	Index (j)	Grid Line (hr)	Index (j)	Grid Line (hr)
75-150	1	61.11	1	0.20	21	19.95
	2	78.72	2	0.25	22	25.12
	3	104.42	3	0.32	23	31.62
	4	130.65	4	0.40	24	39.81
150-300	5	168.30	5	0.50	25	50.12
	6	216.81	6	0.63	26	63.10
	7	279.32	7	0.79	27	79.43
300-530	8	359.82	8	1.00	28	100.00
	9	463.55	9	1.26	29	125.89
530-830	10	597.17	10	1.58	30	158.49
	11	769.29	11	2.00	31	199.53
830-1100	12	991.04	12	2.51	32	251.19
1100-1500	13	1276.71	13	3.16	33	316.23
1500-3000	14	1644.72	14	3.98	34	398.11
	15	2118.81	15	5.01	35	501.19
	16	2729.55	16	6.31	36	630.96
3000-4500	17	3516.35	17	7.94	37	794.33
	18	4529.94	18	10.00	38	1000.00
	--	--	19	12.59	39	1258.93
	--	--	20	15.85	--	--

Similarly, the time grid lines, indexed by j , $j = 1, 2, \dots, 39$, represent time values listed in Table 30, and are given by

$$t_j = 10^{(0.10j-0.8)} \text{ hr} . \quad (22)$$

Note that the outermost grid lines in both cases fall just outside the area covered by the symptom map.

The boundary conditions were chosen by making a priori assumptions regarding the extremes where performance is 100 percent (nondegraded) or

0 percent (totally degraded). Those particular boundary conditions were derived to ensure a smooth transition of the performance surface between the boundaries and the interior regions. The functional forms of the following boundary value formulas are not based on any specific theoretical model, but yield curves that are not inconsistent with the data and represent the perceived effects of radiation exposure on humans at the boundary extremes. Those boundary conditions, specified in terms of performance fraction p , will be described in terms of four areas of the grid in the same manner in which they were implemented in the analysis. Dose values are in rads (cGy), time in hours.

1. Upper edge ($D = 4529.928$) (23)

$$0.1995 \leq t \leq 0.2606: p = 1.0$$

$$0.2606 \leq t \leq 3.1623: p = (1 + \epsilon) \exp [-(a + b \log_{10} t)] - \epsilon$$

$$a = 1.32819$$

$$b = 2.27430$$

$$\epsilon = 0.0928716$$

$$3.1623 \leq t \leq 1258.925: p = 0.$$

The shape and effect of this boundary condition are particularly evident on the three-dimensional plots and correspond to falloff area 1 indicated in Fig. 42.

2. Right edge ($t = 1258.925$)

$$61.107 \leq D \leq 168.303: p = 1.0$$

$$597.161 \leq D \leq 4529.928: p = 0$$

$168.303 \leq D \leq 597.161$: This falloff area, indicated in Fig. 42, is the least well known on the grid. A smooth transition from the data area was achieved most often by setting

$$p = a - b \log_{10} D \quad (24)$$

$$a = 4.31952$$

$$b = 1.58364$$

for two points at $D = 141.421$ and $D = 264.575$. The french curve algorithm (discussed below) was then used to generate a

curve through these points (see Fig. 42). The actual shape is evident on the three-dimensional plots and corresponds to fall-off area 2 in Fig. 42.

3. $p = 0$ limit (upper-right boundary)

$$D \geq 597.161$$

$$t \geq 70.795$$

$$\log_{10} D = \frac{1.43}{1 + \exp(a \log_{10} t - b)} + 2.44609 \quad (25)$$

$$a = 2.32698$$

$$b = 6.00965.$$

This curve is easily seen on the contour plots.

4. $p = 1.0$ limit (left and lower boundary)

$0.1995 \leq t \leq 0.2606$: All doses; same as upper edge limit

$$0.2606 \leq t \leq 6.9314: \log_{10} D = 2.92609 - 1.25 \log_{10} t$$

$$6.9314 \leq t \leq 13.8523: D = 75.0$$

$$13.8523 \leq t \leq 1258.9254: \log_{10} D = a + b \ln(\log_{10} t - c) \quad (26)$$

$$a = 2.16549$$

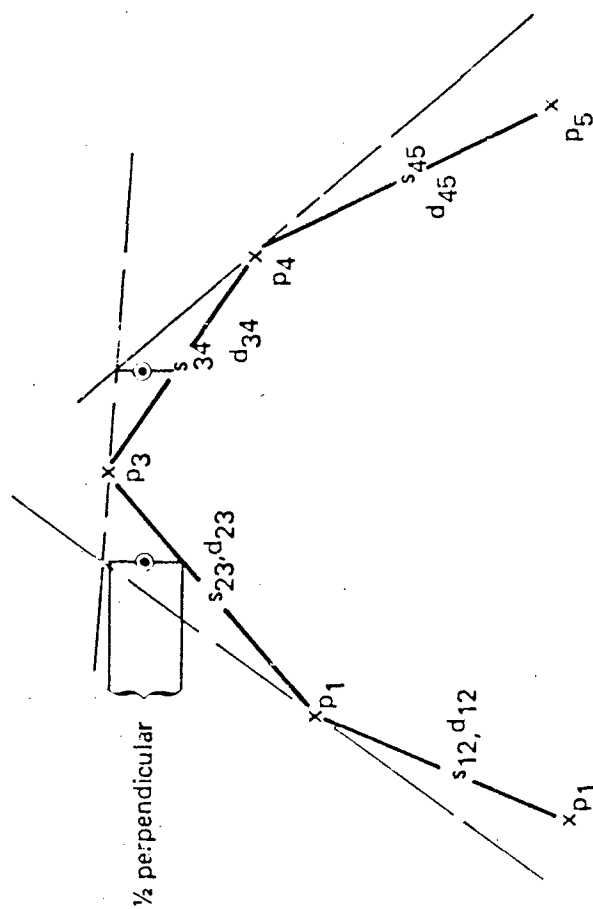
$$b = 0.0877468$$

$$c = 1.105.$$

Again, this curve is clearly evident on the contour plots and in Fig. 42.

The actual procedure for generating time output data uses the FCA mentioned previously. That algorithm fits as smooth a curve as possible to irregularly spaced values for a single independent variable. Figure 43 shows the basic technique, which is to estimate the slope at two adjacent points and then find the intersection (if any) of their tangents. A new point on the curve is generated by dropping a perpendicular from that intersection to the line connecting the original points and choosing the new point halfway between. This procedure is done for each adjacent

s - Slope
 d - Distance between points (logarithmic)
 x - Regression data points (N)
 ● - New points



$$\frac{(N-1)}{\text{Total} \sim 2N-1}$$

$$\vdots$$

$$\text{etc.}$$

$$\vdots$$

 Grand Total ~ 900

$$s(p_2) = \frac{s_{12}(1/d_{12}) + s_{23}(1/d_{23})}{(1/d_{12}) + (1/d_{23})}$$

$$s(p_3) = \frac{s_{23}(1/d_{23}) + s_{34}(1/d_{34})}{(1/d_{23}) + (1/d_{34})}$$

\vdots
 \vdots
 etc.

Figure 43. "French curve" algorithm.

pair of points, so if N points are originally given, $N - 1$ new points are generated. The entire procedure is then repeated on all those $2N - 1$ points, etc., until a desired density of points is achieved.

The algorithm has many desirable properties. It is capable of finding a peak (or valley) higher (or lower) than either of the original points that straddle it. Also, the density of points will be greatest where the curve is changing most rapidly, which is where the most resolution is needed. Most important, the FCA yields a curve that always passes through each and every original data point.

For purposes of fitting to the performance data, a three-step procedure is used. The first step is to generate an essentially continuous curve for each of the eight original dose bands. Input data to the FCA consists of the performance and time values for each of the locations (asterisks) on a given row in Fig. 42. Also included are additional data points corresponding to the boundary condition, the edge of the grid, and halfway between. This is done at both ends of the dose band, and yields six extra data points. Thus, even for the lowest dose band, which has only a single performance input point, a total of seven points, ranging over the entire time range of the grid, is input to the FCA. The result is eight curves of performance versus time.

The second step is to generate 39 different "continuous" curves of performance versus dose, each corresponding to one of the time grid lines. Input data to the FCA are eight performance and dose values (from the eight curves generated in step one) plus additional points for the edge of the grid and boundary conditions. This is done 39 times to yield the desired curves.

Finally, the third step is to generate 18 curves of performance versus time, corresponding to the dose grid lines instead of to the original dose bands. Each of these curves is found by using the FCA with input consisting of 39 data points (from the curves generated in step two) plus boundary conditions.

Three-dimensional plots (given in Sec. 6) result from plotting those 39 constant time curves and 18 constant dose curves as seen from the

appropriate perspective. Note that the tables of output values, given in Appendix J, contain only the performance values at the intersections of the grid lines, and thus do *not* reflect the full resolution shown in the plots.

CONTOUR PLOTS

A similar procedure was used to generate contour plots. The first step, generating the eight performance-versus-time curves, is the same as above. Step two, however, is different. Instead of only 39 time-constant curves, a total of 875 such curves are generated. That procedure yields the performance surface to a very high resolution. (On the scale of Fig. 42, if those 875 vertical lines are drawn, the spacing between them would be less than the width of the lines, i.e., the figure would appear as a solid black block.) Each of these "continuous" curves is in fact not continuous, but consists of 885 points. Thus, the surface is represented by a massive array of $875 \times 885 = 774,375$ points.

Next, each and every one of those points is compared with each of its neighboring points. If one of them is greater than a specified contour level, and the adjacent point is less than that level, then a dot is drawn on the plot for the original point, which then becomes one of the points that forms the contour. The resulting plot is simply a pattern of small dots that appears to the eye as continuous contour lines.

This approach, though tedious, eliminates the need for fitting local analytic approximations to describe the surface, which is the procedure used by most traditional contour plot algorithms. As a result the very detailed resolution of the FCA is preserved in the final contour plots.

Using the numerical procedures detailed above, we describe three-dimensional crewmember performance surfaces and isoperformance contours as a function of dose and postexposure time. In the following section, the overall picture of crewmember performance provided by three-dimensional plots, as well as the isoperformance contours that enable numerical performance estimates to be made graphically is described.

SECTION 6

RESULTS AND DISCUSSION

This section details the relationships of individual crewmember performance with acute radiation dose and time after exposure. The relationships are expressed graphically, based on the calculational methods described in Sec. 5 for the 15 artillery, tank, and TOW combat crewmember positions. Comparisons of the performance of five different types of crewmembers according to task similarities are detailed as a function of dose and time following exposure. Also presented and discussed are the confidence bounds associated with our individual performance predictions in order to illustrate the conditional uncertainty associated with the regression predictions of Sec. 3.

PERFORMANCE SURFACES

Three-dimensional surface representations of the relationship of individual performance to dose and time following a single prompt exposure are shown in Figs. 44 through 58 for each of the 15 crewmembers. The figures provide an overall picture of individual performance as a function of dose and time. Individual performance in percent is expressed as the vertical axis, with dose and time along the horizontal axis. Dose and time are both expressed logarithmically in order to include the entire intermediate dose range of 75 to 4500 rads (cGy) and time (minutes to 6 weeks) on each graph. Accordingly, a visual distortion is introduced where the slope of the surface for small doses and/or early times appears much more pronounced than that of large doses and/or times.

The particular orientation of the axes with the large values of dose and time at the bottom of the graphs enables a more revealing view of the performance surface than if the axes were oriented in the conventional manner with the smaller values at the bottom. The orthogonal lines along the surface are the 18-dose by 39-dose grid lines specified in Sec. 5. The end segments of the grid lines extending to the axes are dashed to indicate the span between input data and specified boundary conditions (discussed in Sec. 5), also shown as dashed lines. Insofar

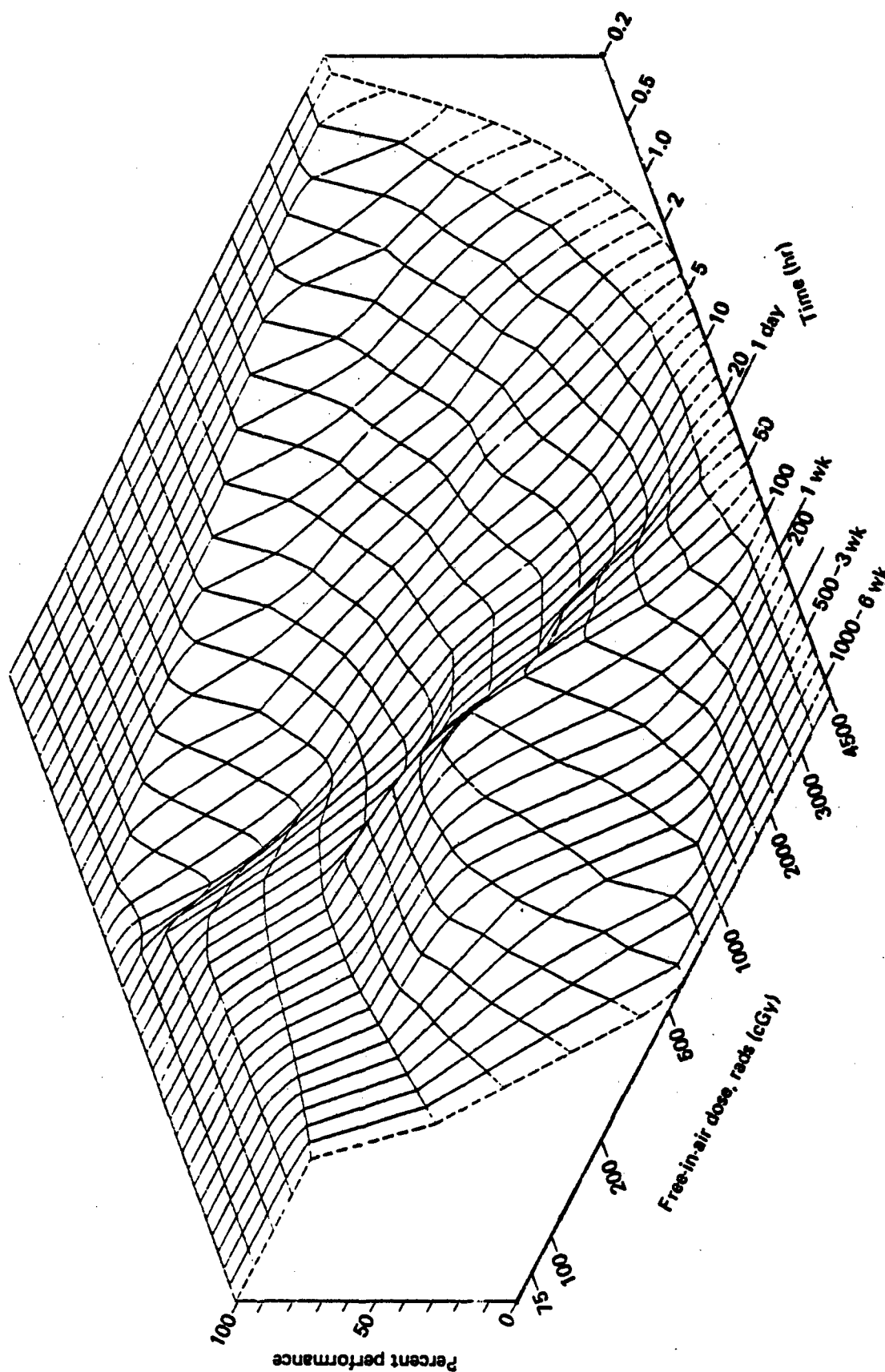


Figure 44. Performance surface: gun crew, chief of section.

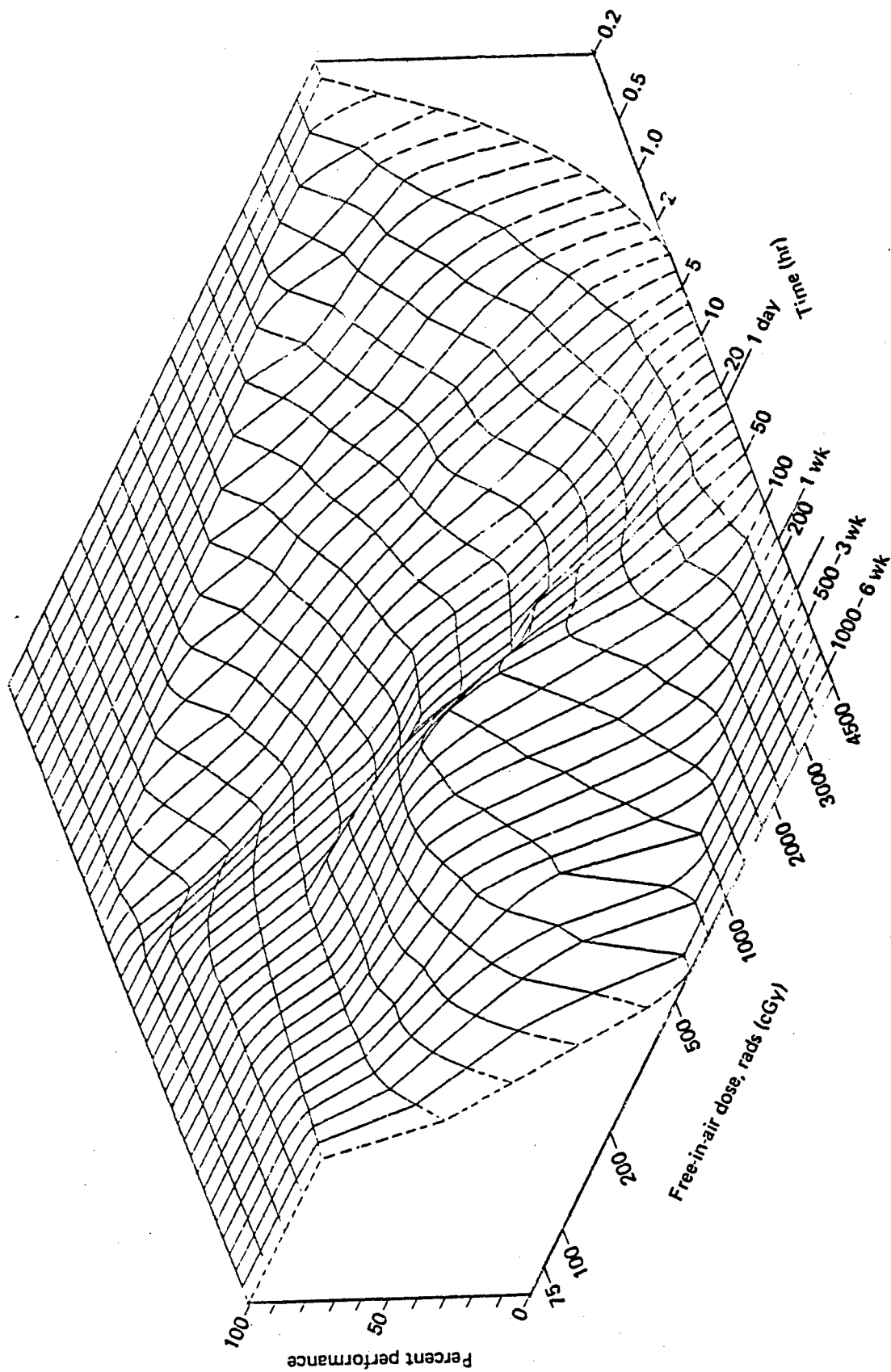


Figure 45. Performance surface: gun crew, gunner.

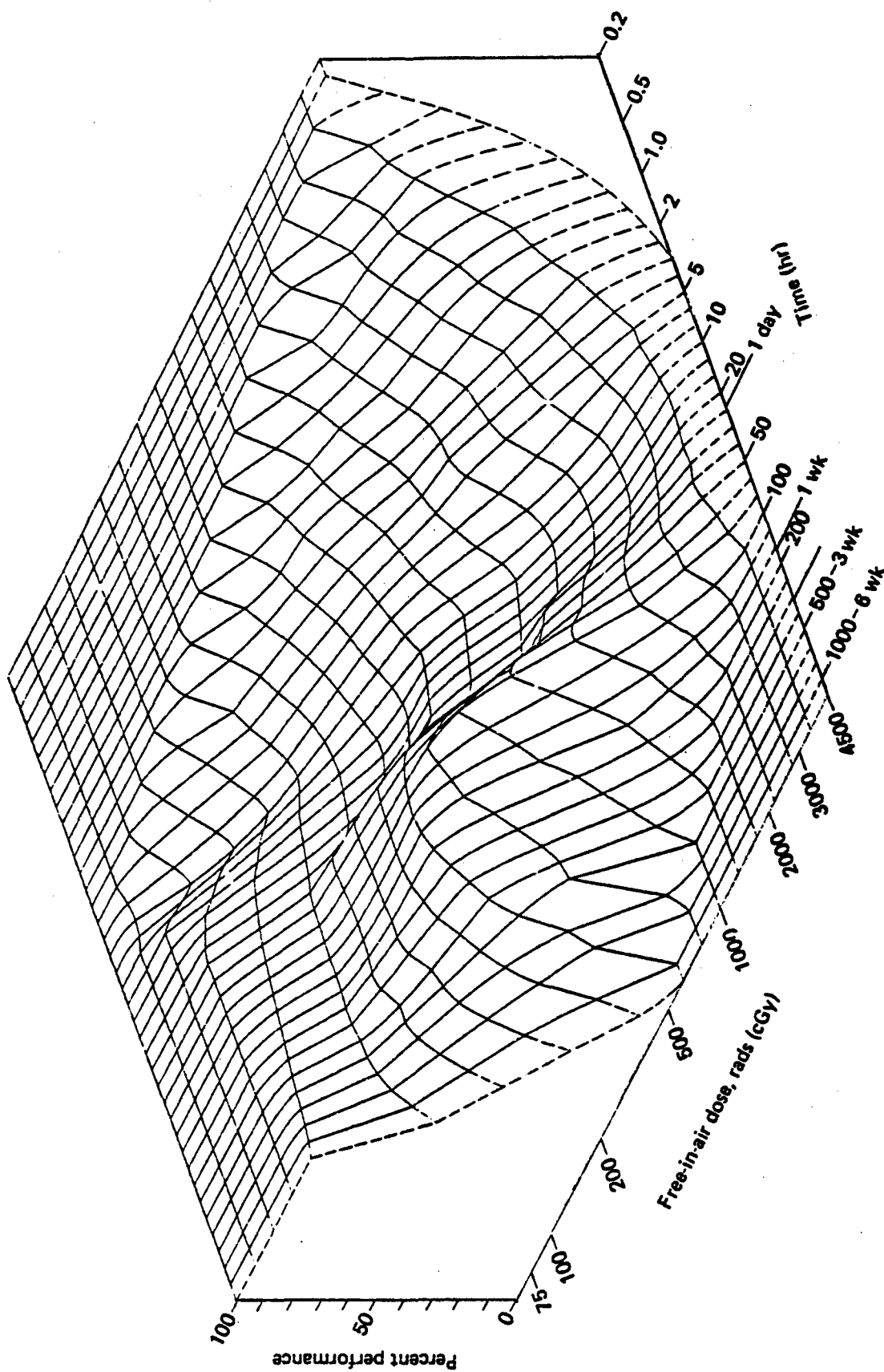


Figure 46. Performance surface: gun crew, assistant gunner.

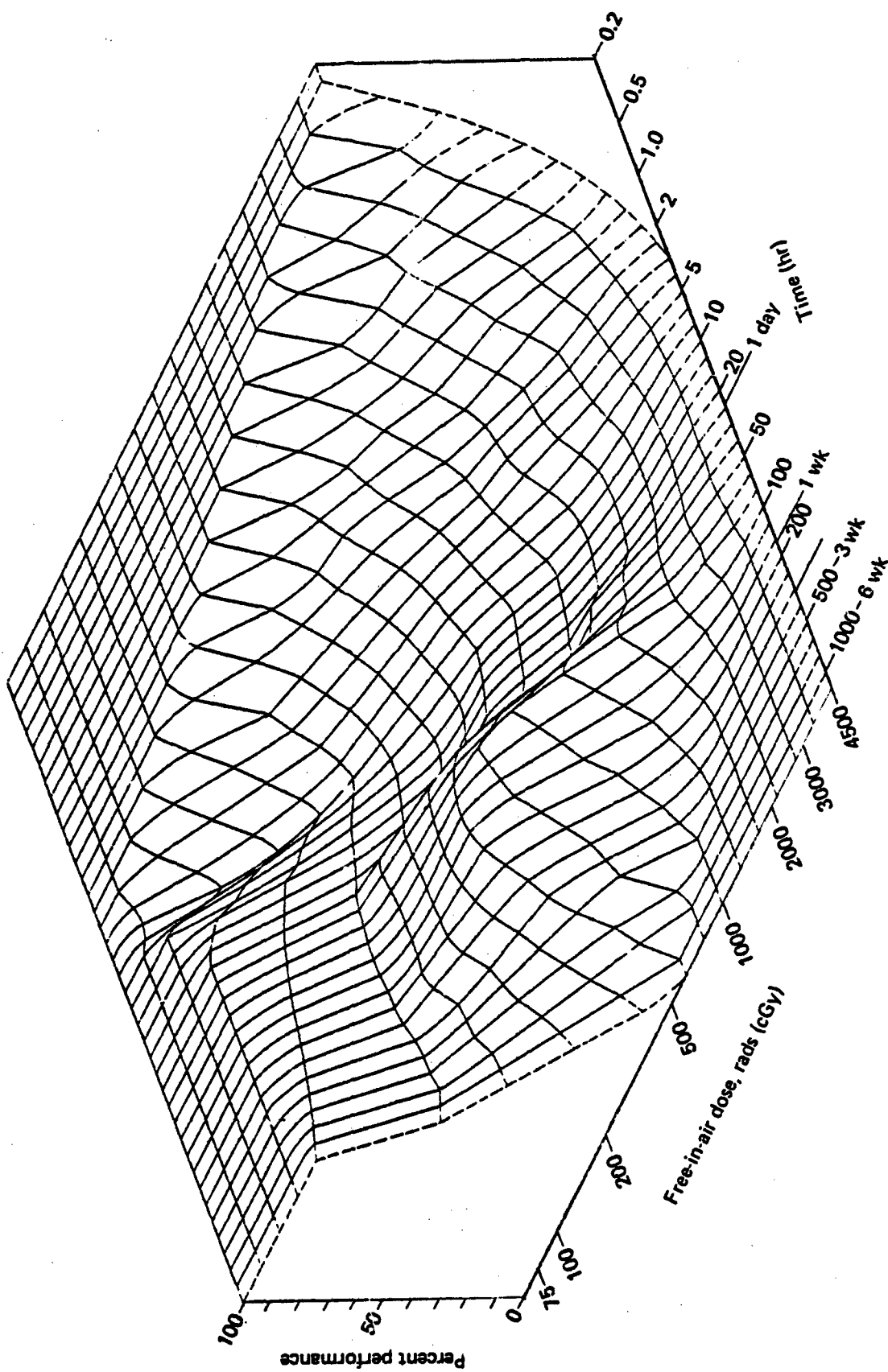


Figure 47. Performance surface: gun crew, loader.

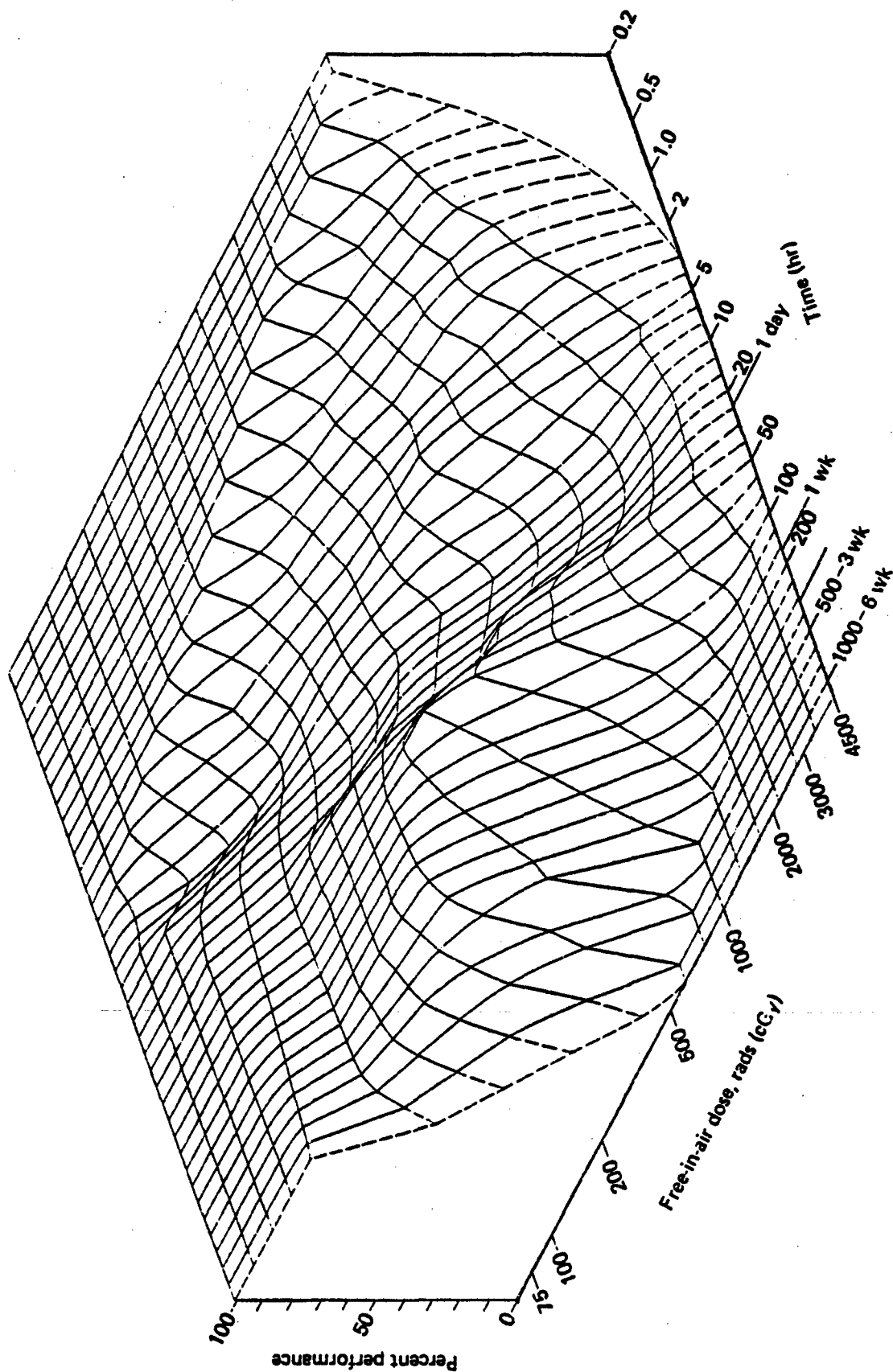


Figure 48. Performance surface: FDC crew, fire direction officer.

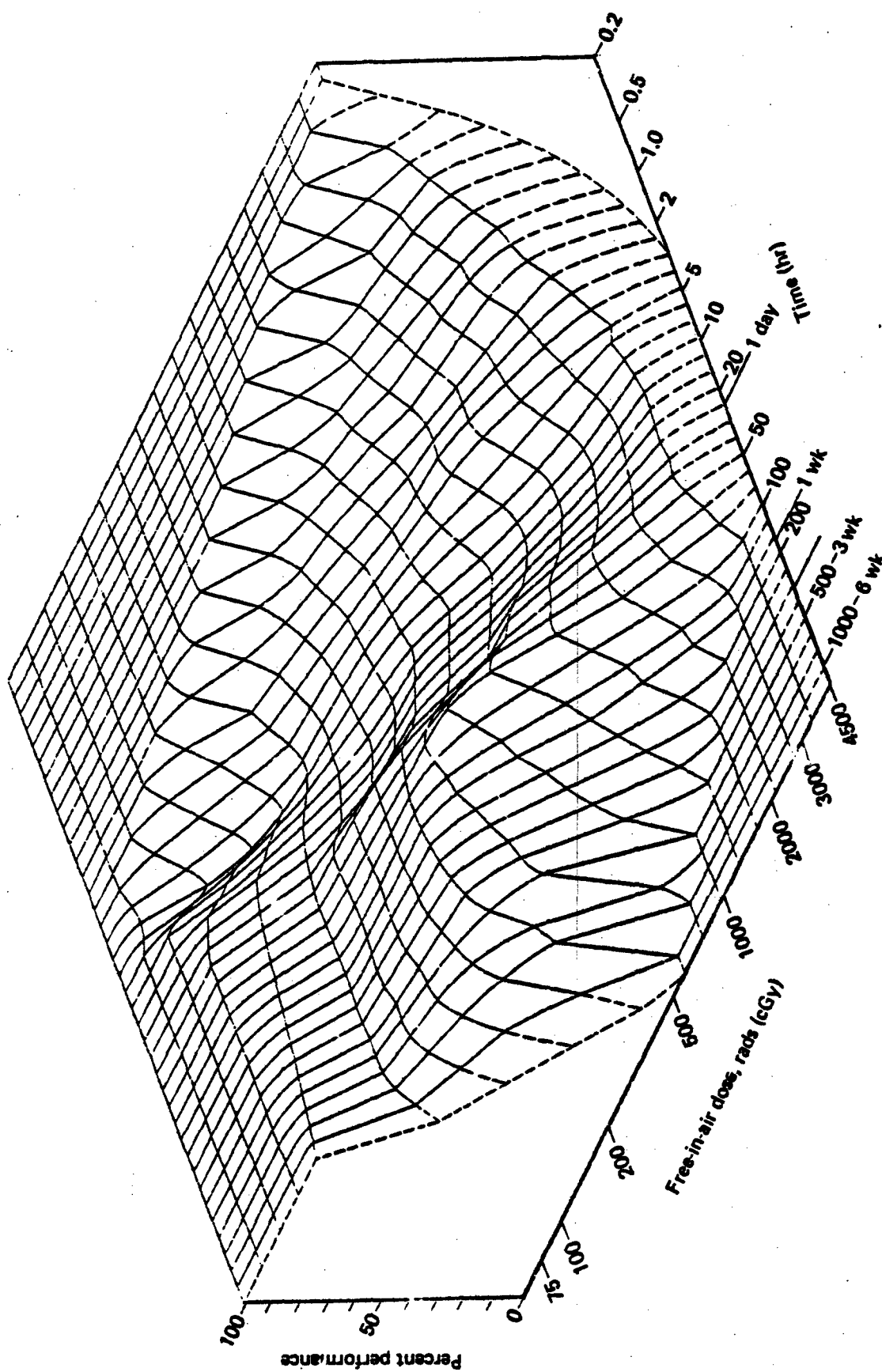


Figure 49. Performance surface: FDC crew, horizontal control operator.

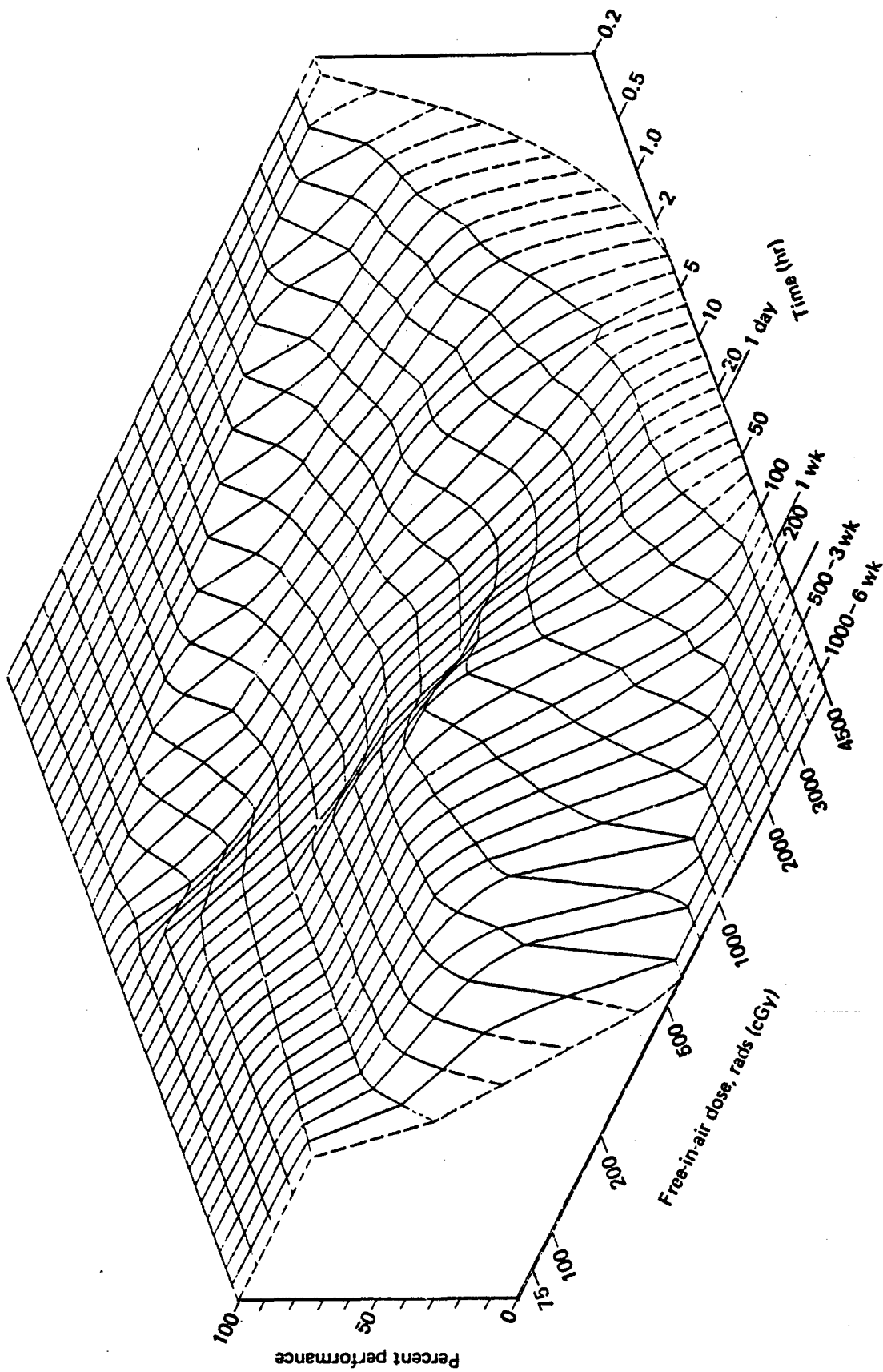


Figure 50. Performance surface: FDC crew, computer.

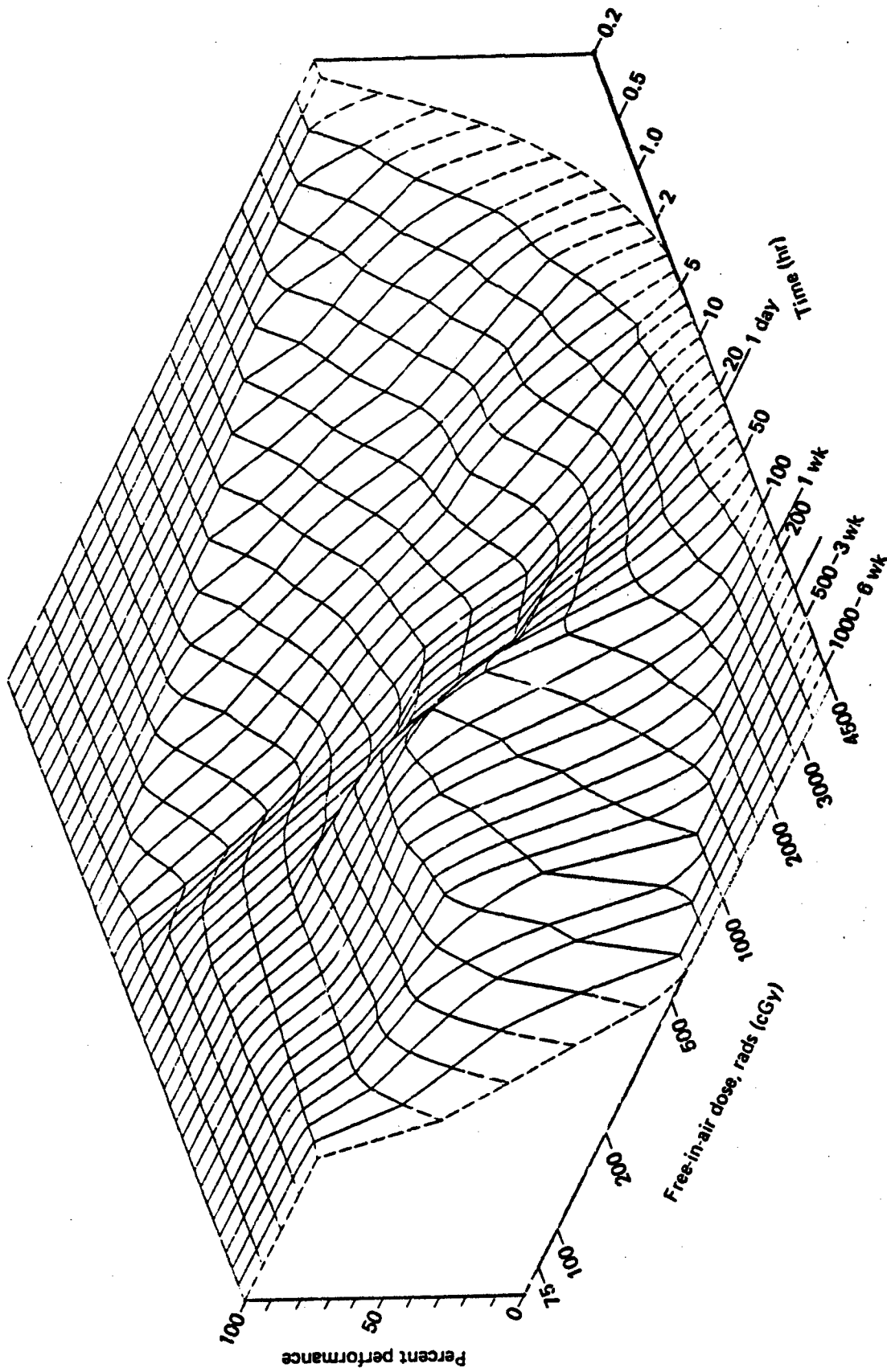


Figure 51. Performance surface: tank crew, tank commander.

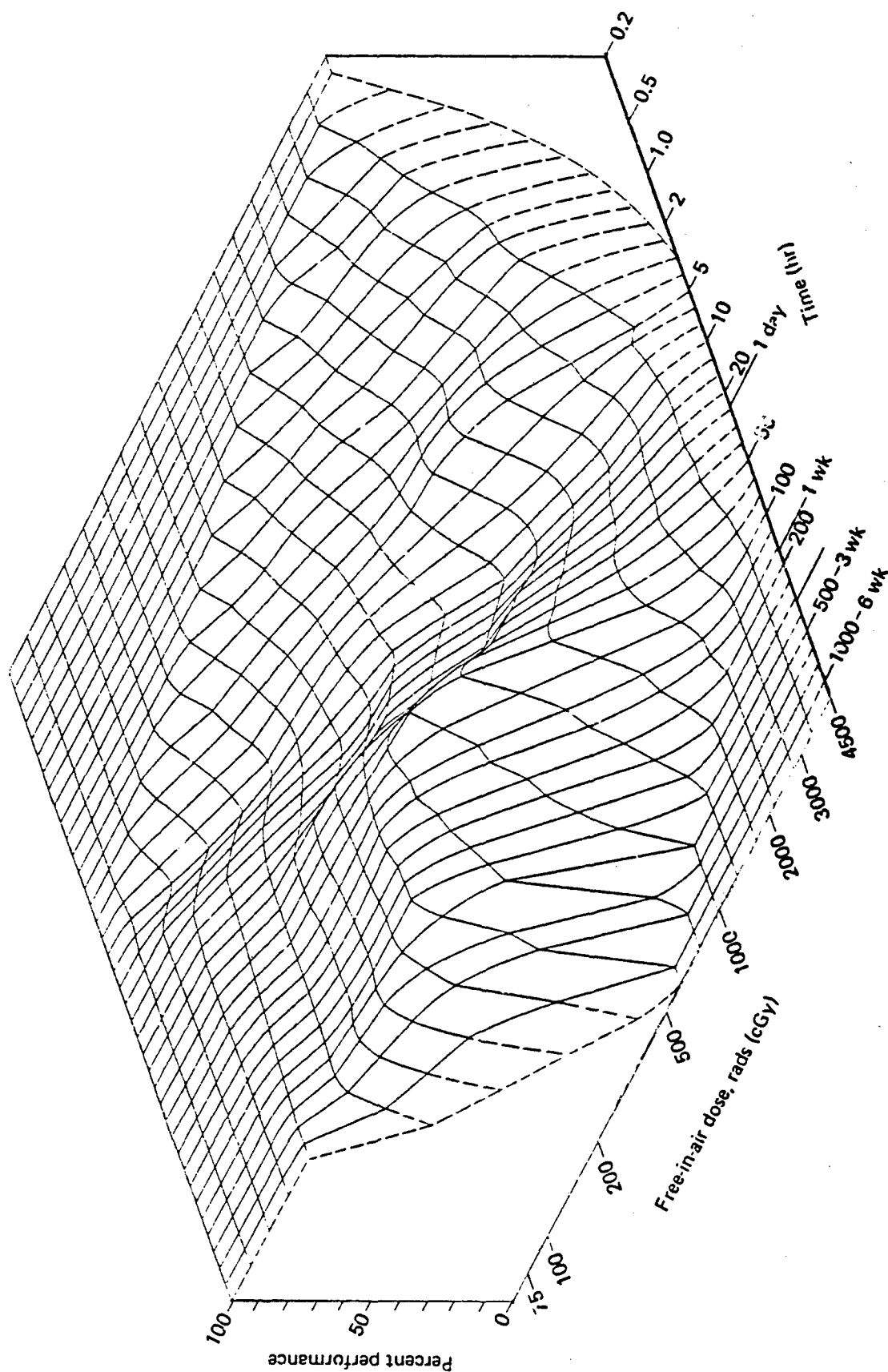


Figure 52. Performance surface: tank crew, gunner.

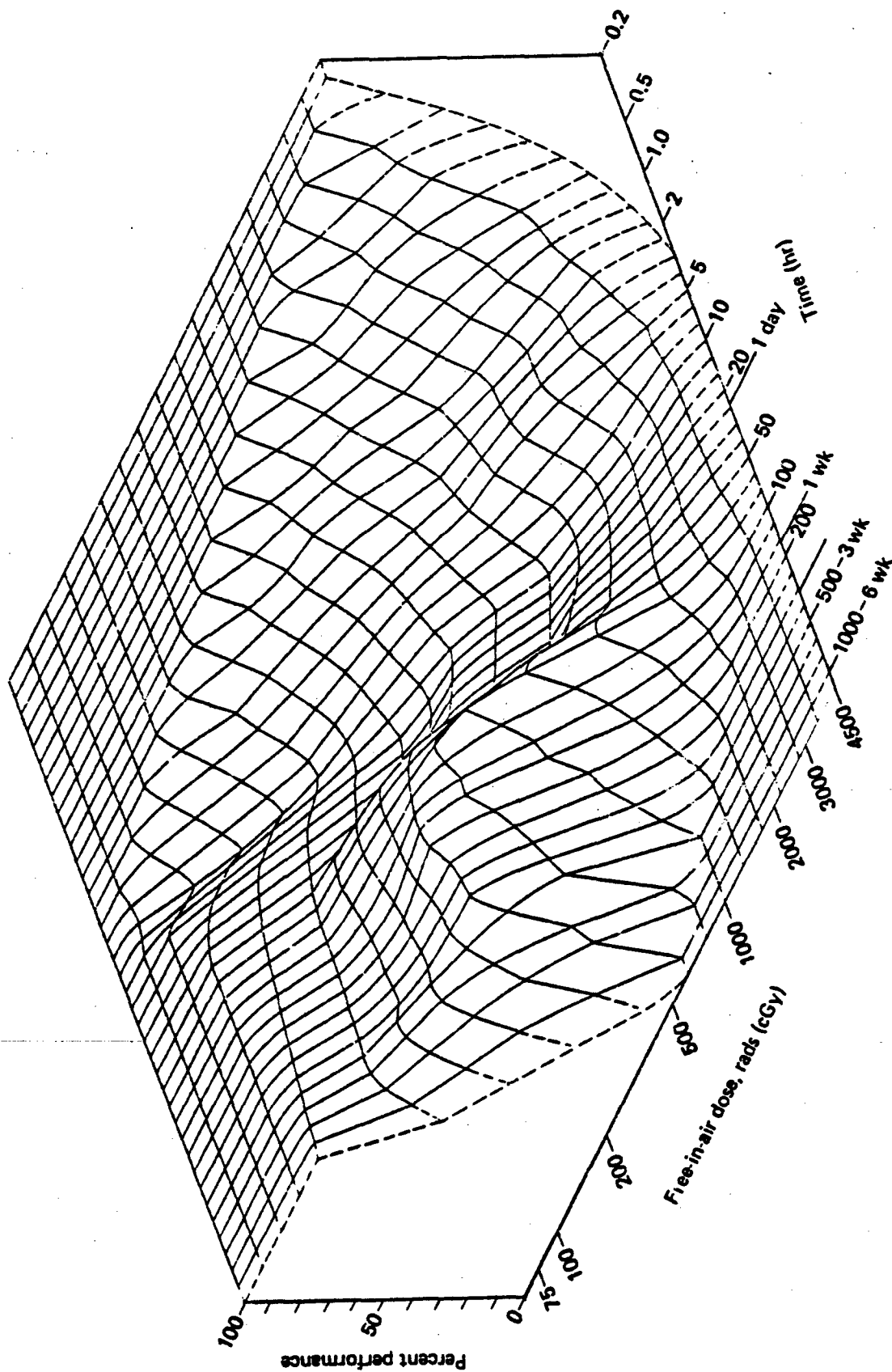


Figure 53. Performance surface: tank crew, loader.

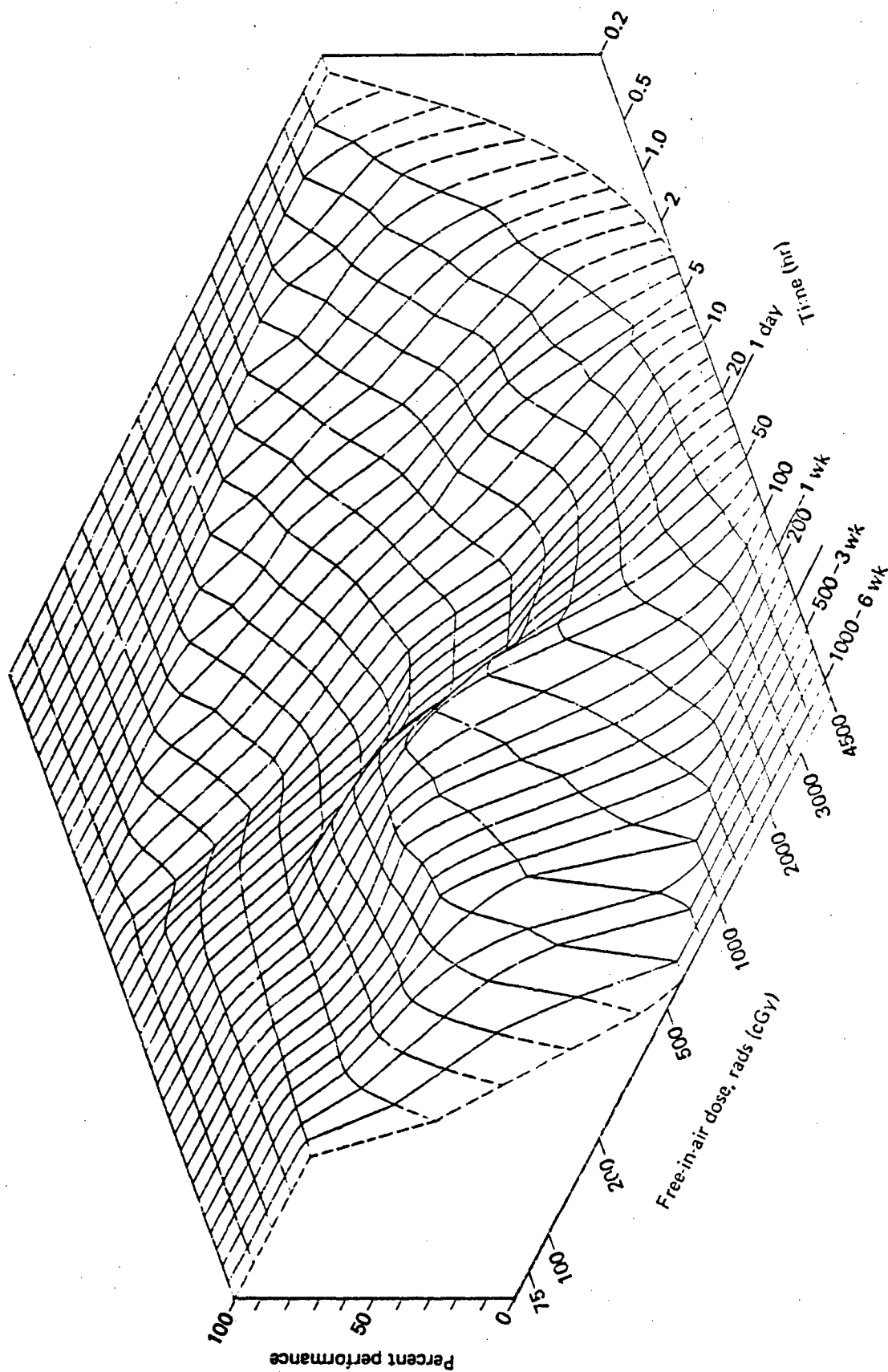


Figure 54. Performance surface: tank crew, driver.

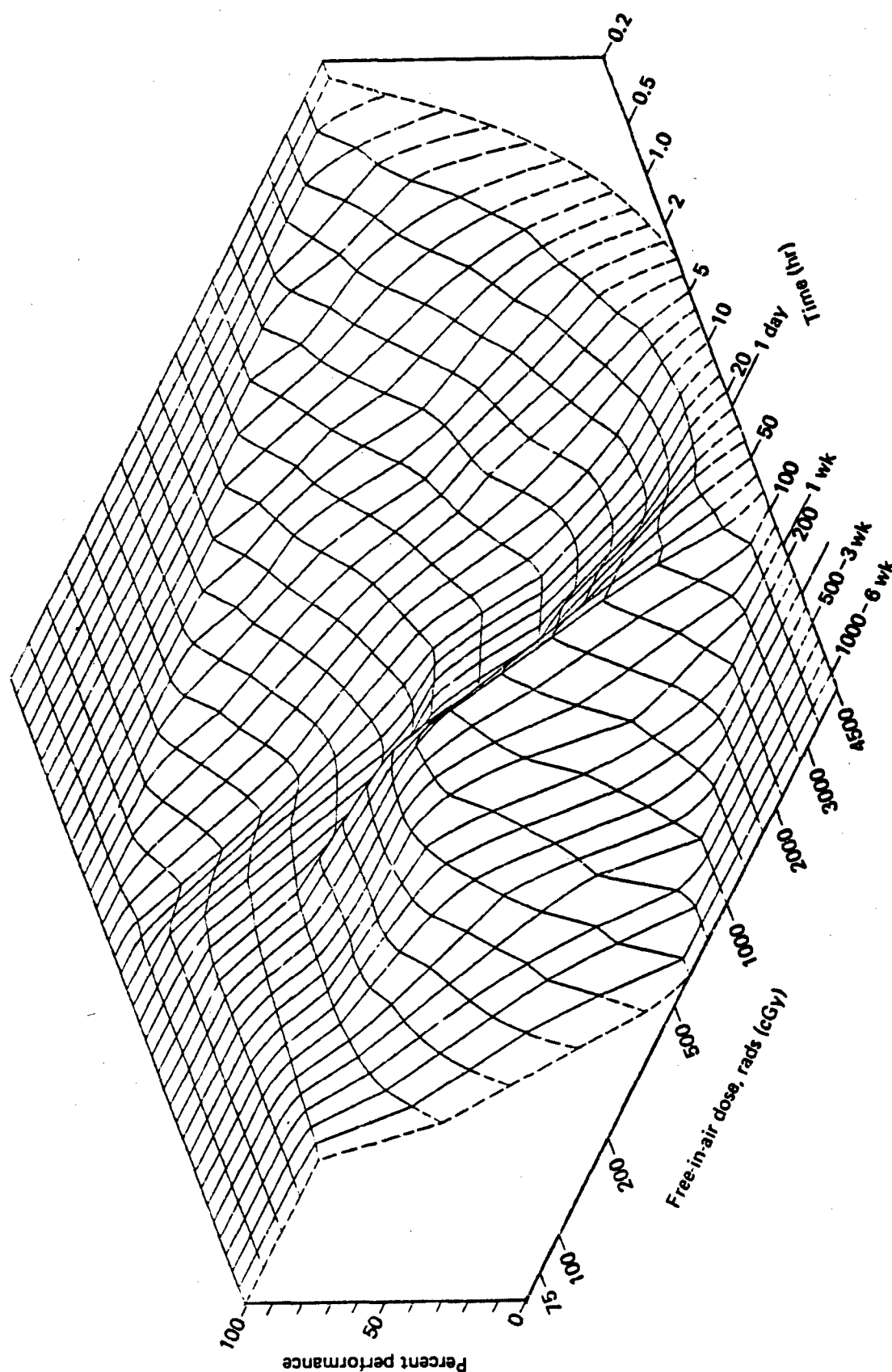


Figure 55. Performance surface: TOW crew, squad leader.

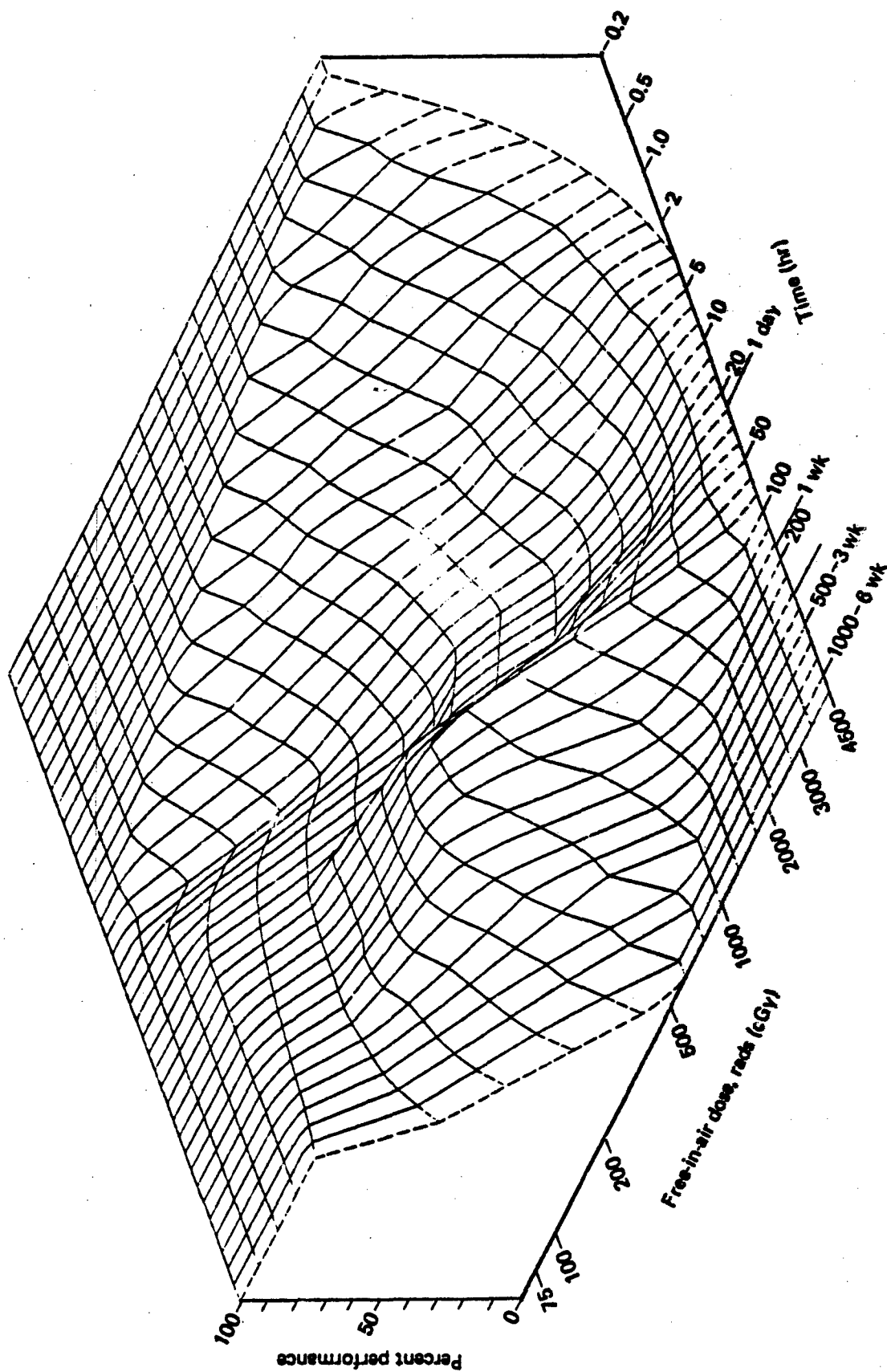


Figure 56. Performance surface: TOW crew, gunner.

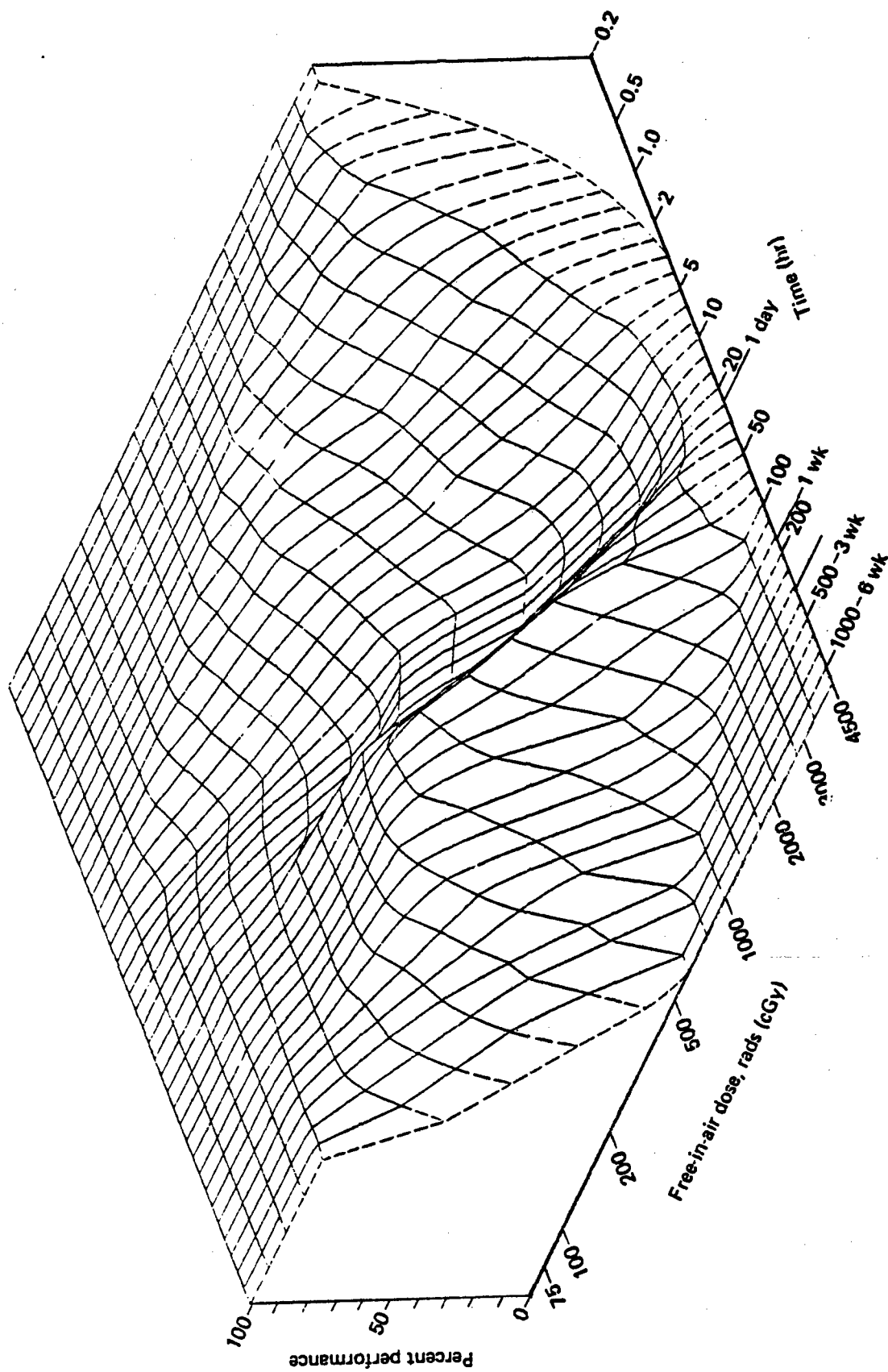


Figure 57. Performance surface: TOW crew, driver.

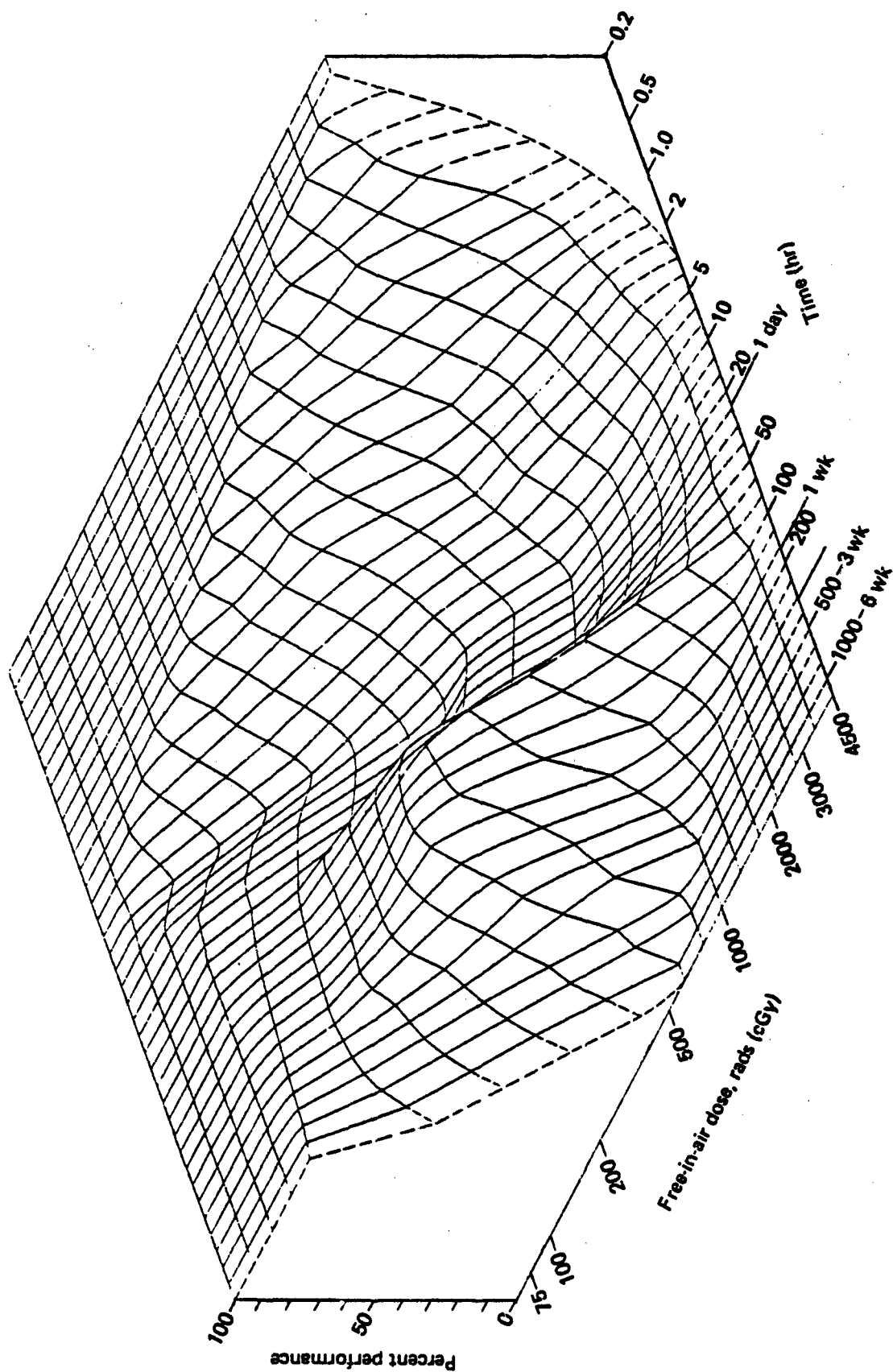


Figure 58. Performance surface: TOW crew, loader.

as the boundary conditions are not based explicitly on input data, the dashed portions reflect a greater degree of uncertainty as compared with the solid grid lines.

Surface depressions indicate where performance becomes degraded. The initial overall depression is related to the prodromal symptomatology, which includes nausea, vomiting, fatigue, weakness, and initial fluid loss [also hypotension and fever at the higher doses beginning at around 1100 to 1500 rads (cGy)]; gastrointestinal effects, because of their relatively lower expected incidence--10 to 30 percent [Baum et al., 1983]--are not included in Figs. 44 through 58.* The broad rise in the performance surfaces toward the left side of the graphs is related to some remission of the prodromal symptoms, prior to the onset of delayed ones (manifest illness period) such as infection, bleeding, fever, lower gastrointestinal distress, fluid loss, and reoccurrence of symptoms such as nausea, vomiting, fatigability, and weakness. For doses exceeding around 600 rads (cGy), the height and width of the rise progressively disappear, reflecting reduced recovery consistent with the increasingly severe symptomatology [Baum et al., 1983].

At the high-dose edge of the plots, the downward slope of the surface near the boundary is more apparent the higher the performance estimates, e.g., as in Fig. 50 for the FDC computer crewmember. That effect is due to matching the boundary condition using the logit model for the regression predictions. For example, in excess of about 3 hr, the boundary condition is assumed to be zero, whereas the logit form predicts values that approach but do not equal zero.

ISOPERFORMANCE CONTOURS

Isoperformance levels for the 15 crewmembers as a function of dose and time after exposure are given in Figs. 59 through 73. The contour level plots, shown in increments of 10 percent, can be used to extract performance estimates. The plots also contain estimates of the percent incidence of those expected to suffer from the effects of radiation

* Performance surfaces that include early lower gastrointestinal effects are provided in Appendix H.

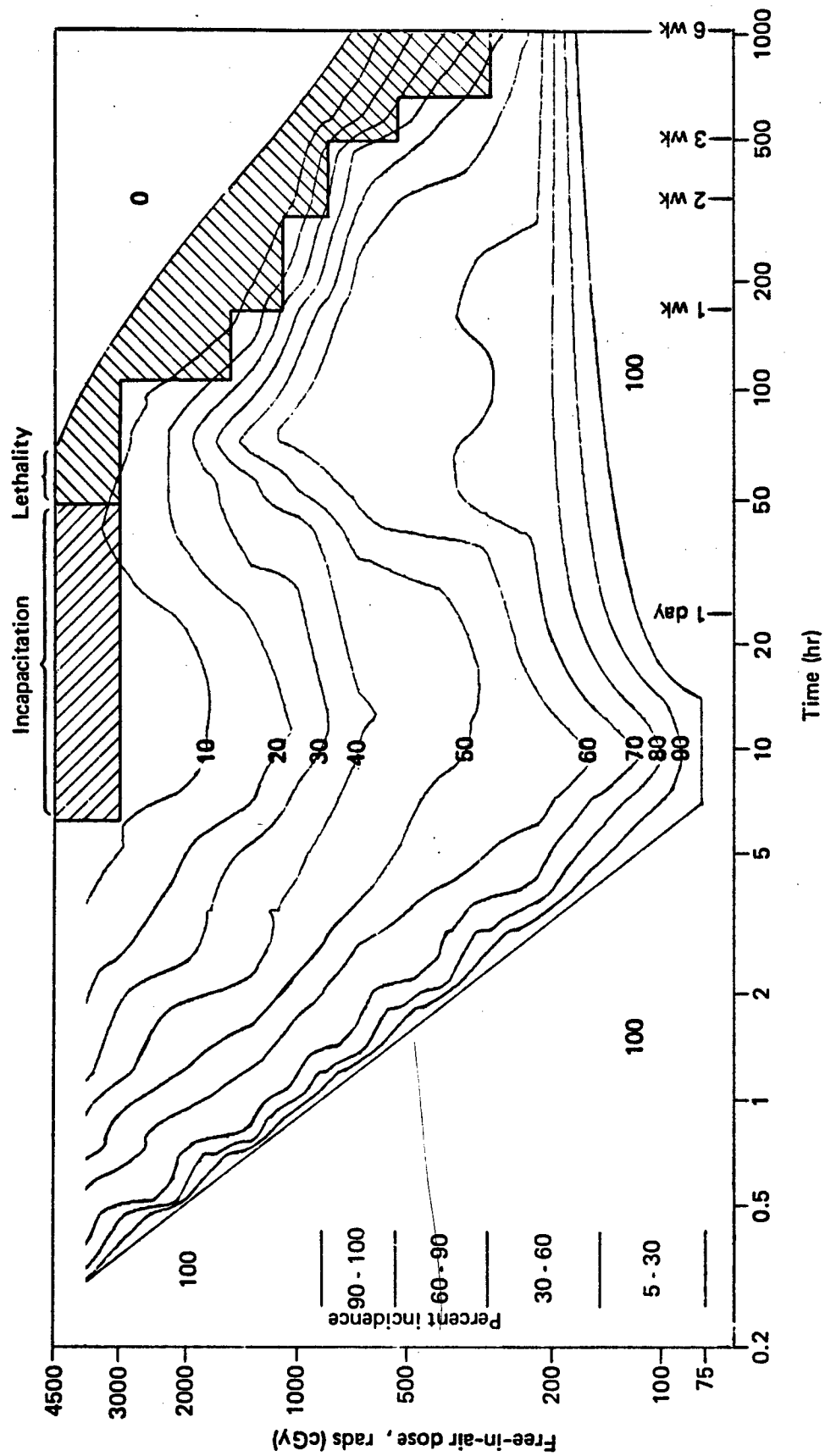


Figure 59. Performance contours, 10 percent performance intervals: gun crew, chief of section.

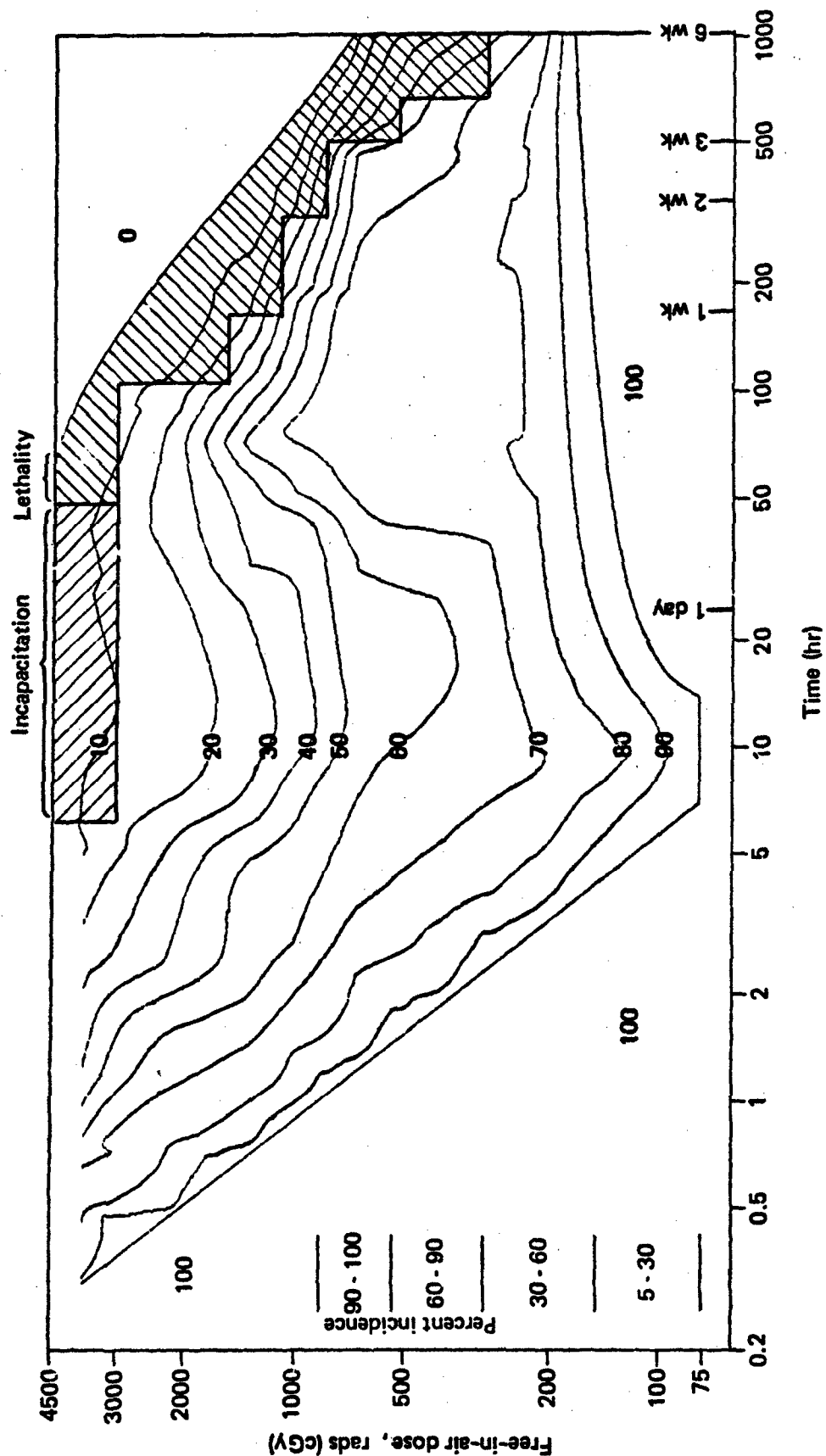


Figure 60. Performance contours, 10 percent performance intervals: gun crew, gunner.

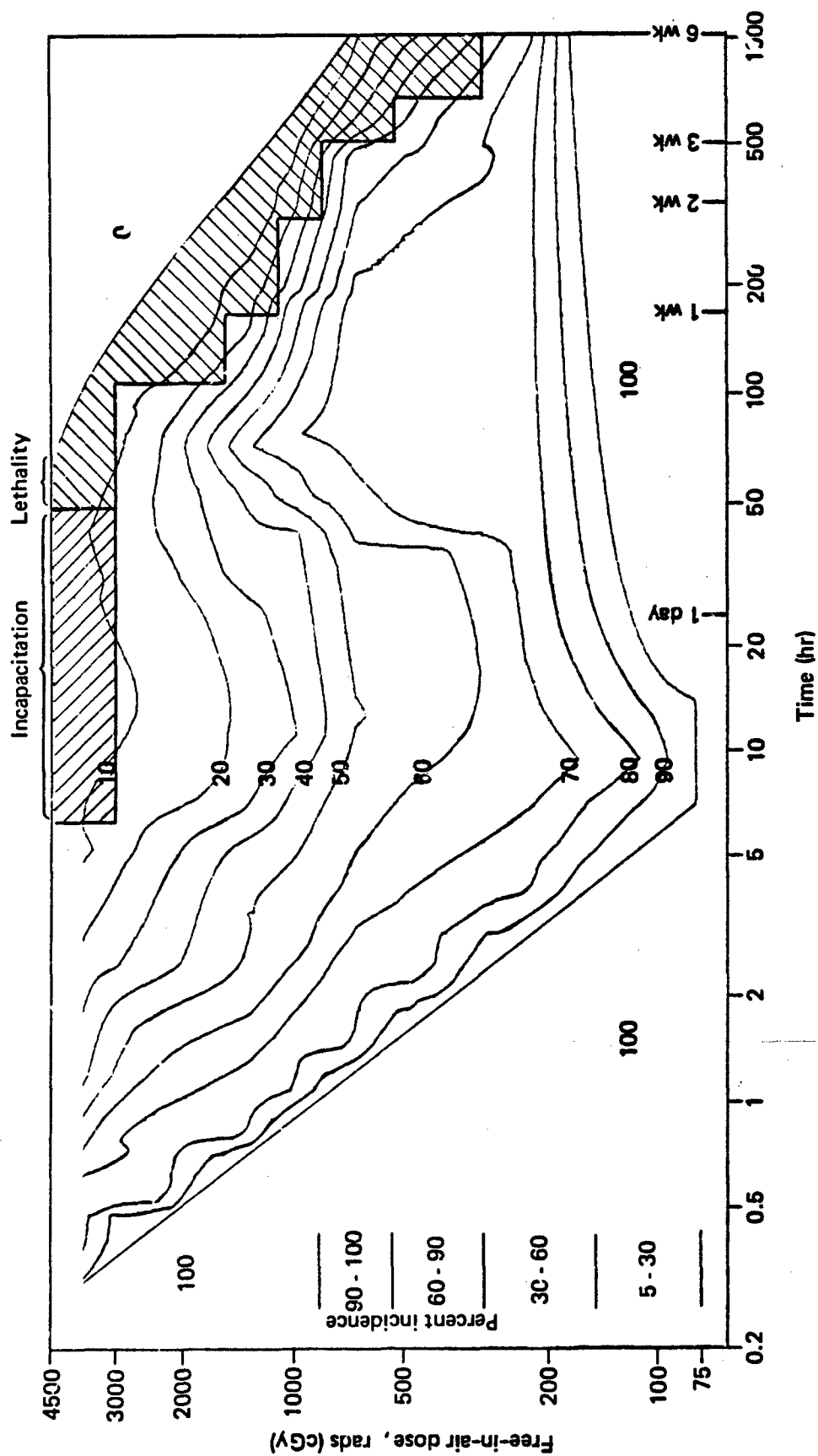


Figure 61. Performance contours, 10 percent performance intervals: gun crew, assistant gunner.

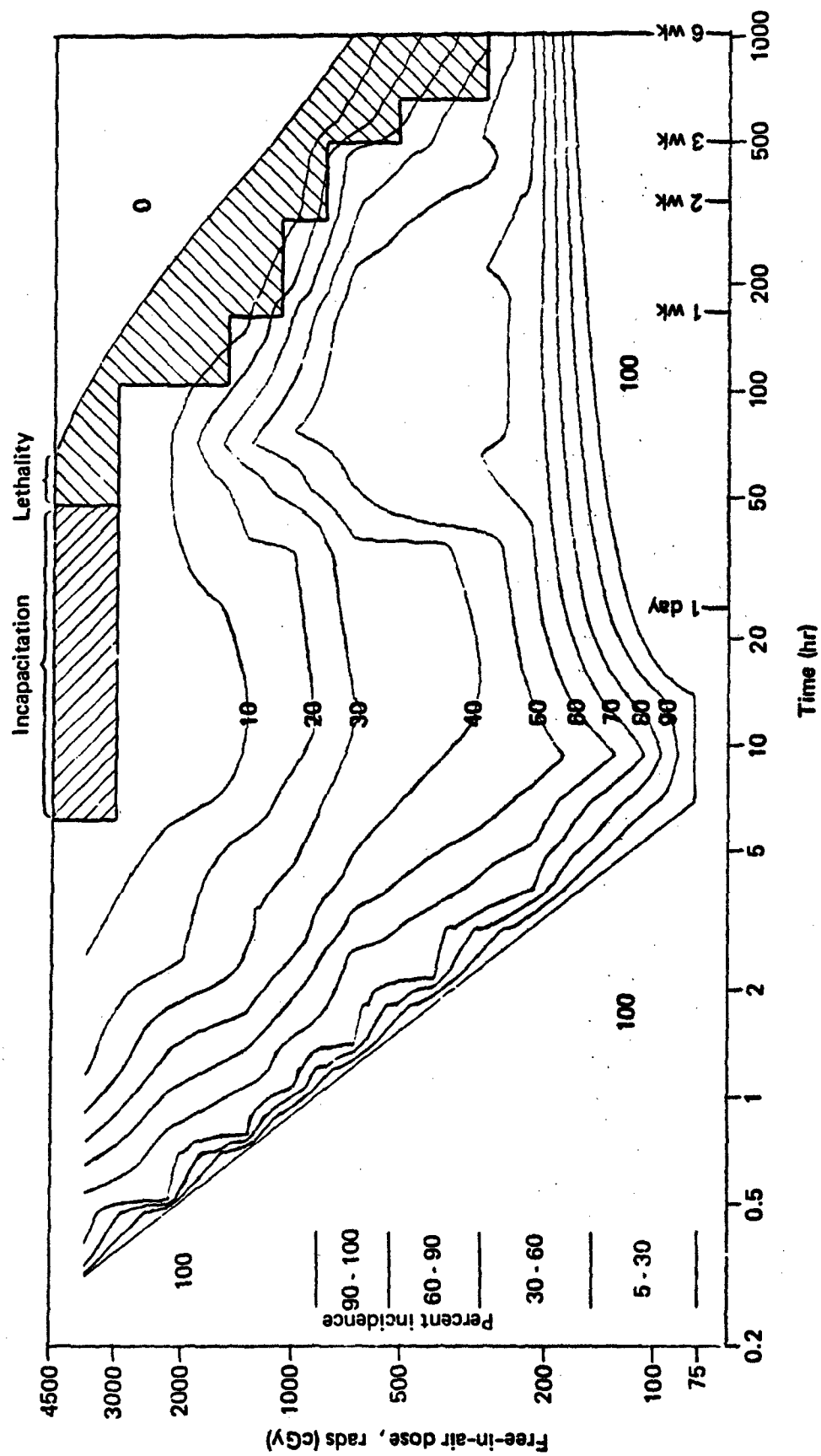


Figure 62. Performance contours, 10 percent performance intervals: gun crew, loader.

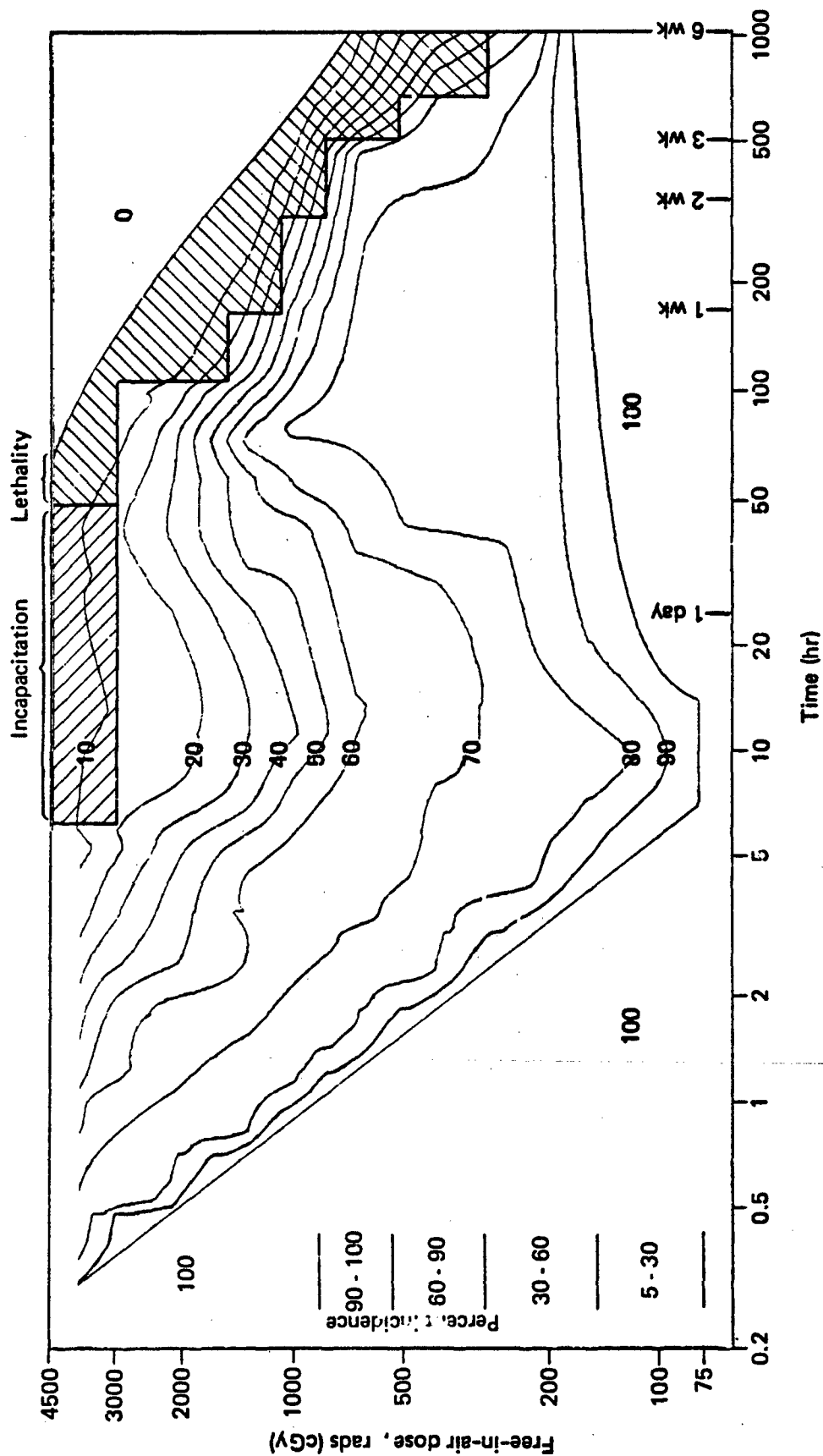


Figure 63. Performance contours, 10 percent performance intervals: FDC crew, fire direction officer.

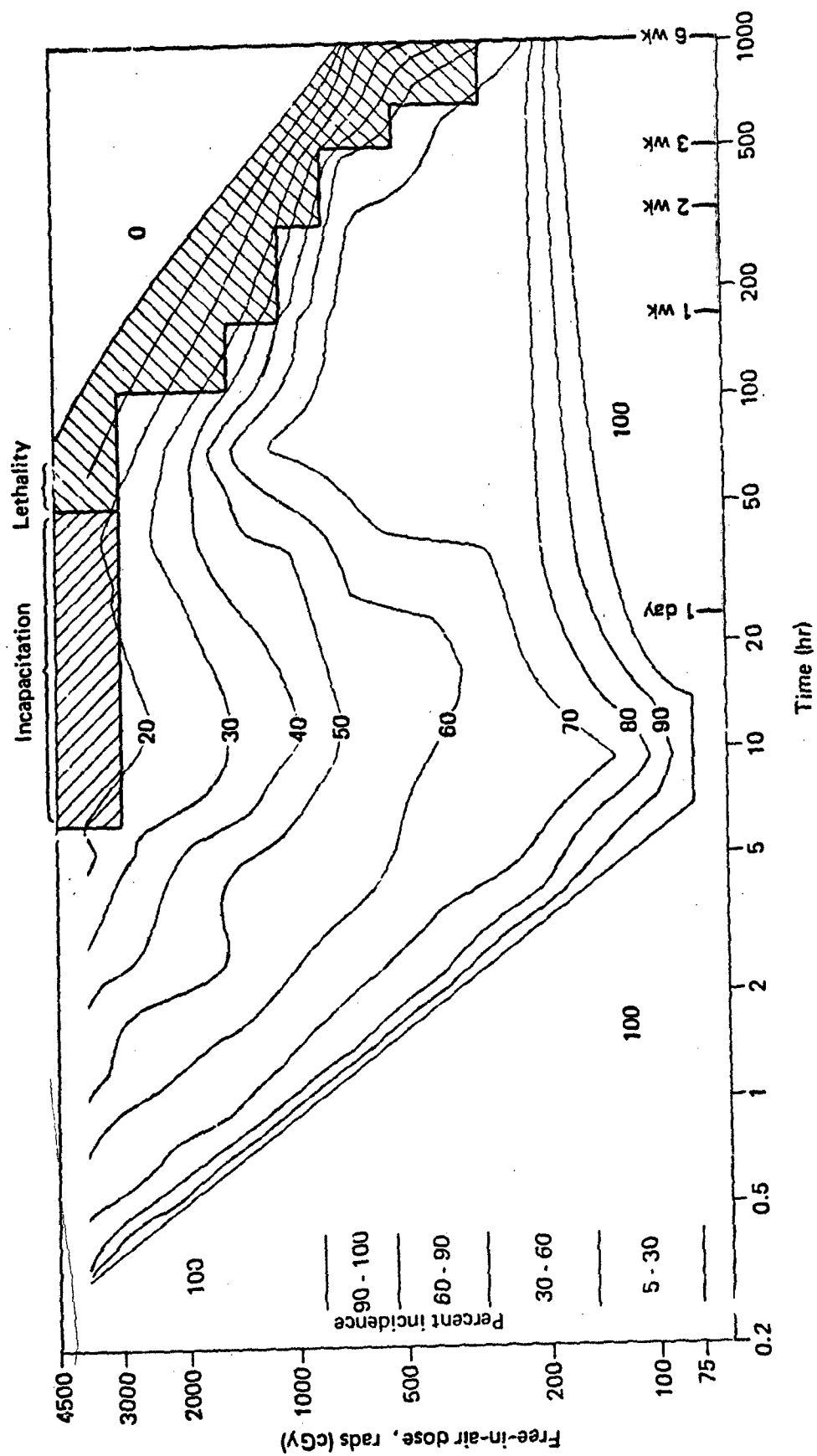


Figure 64. Performance contours, 10 percent performance intervals: FDC crew, horizontal control operator.

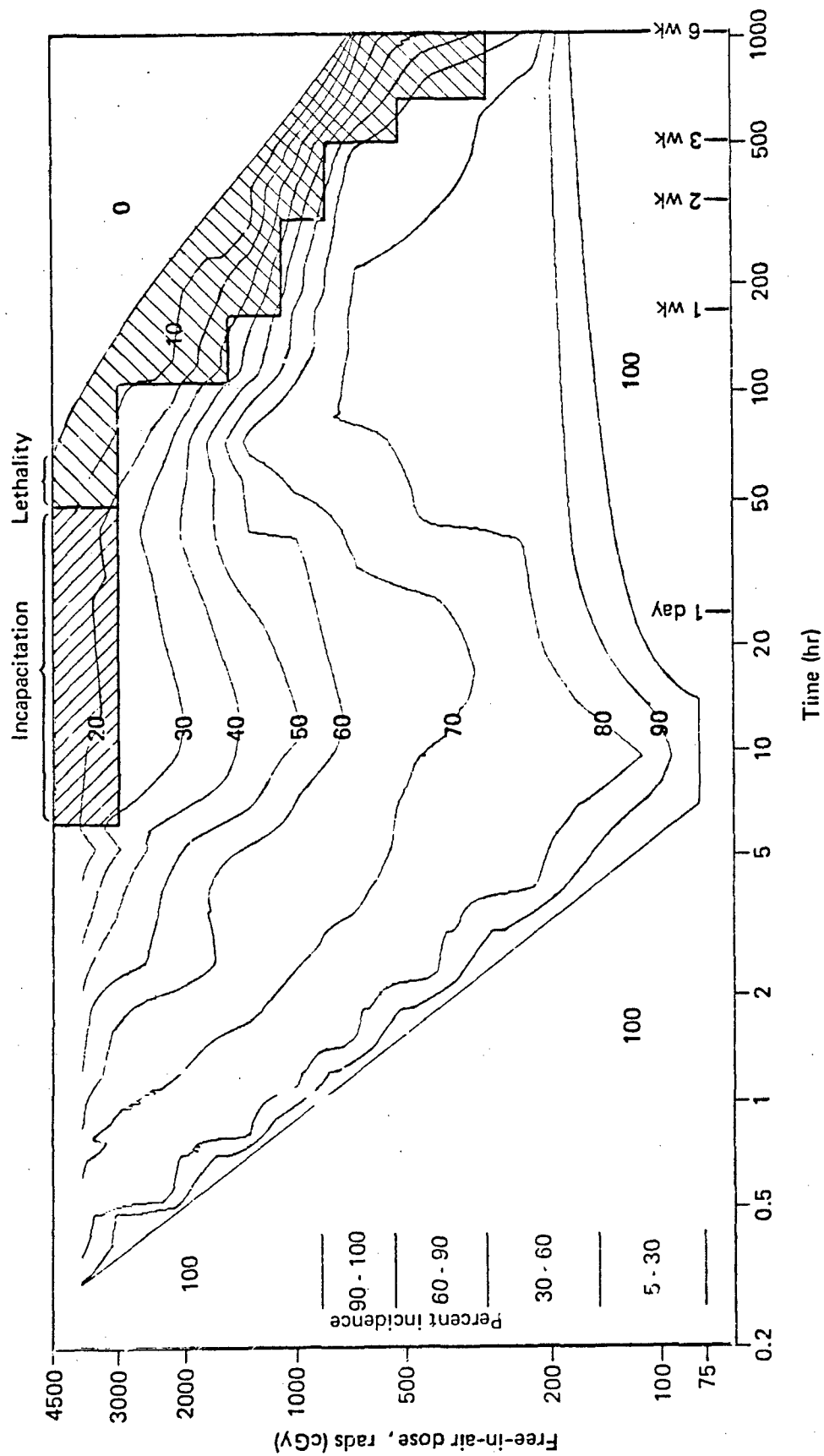


Figure 65. Performance contours, 10 percent performance intervals: FDC crew, computer.

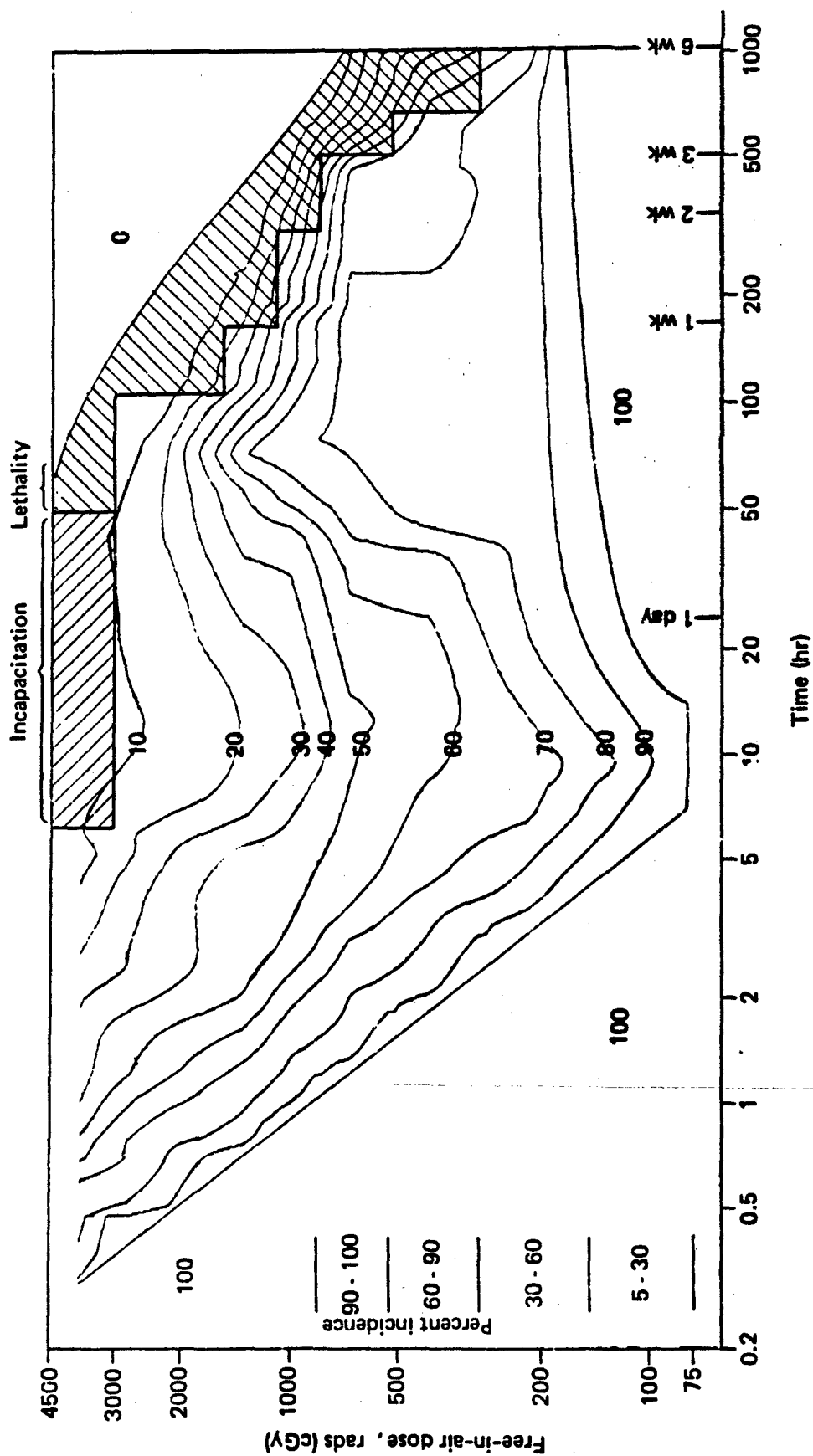


Figure 66. Performance contours, 10 percent performance intervals: tank crew, tank commander.

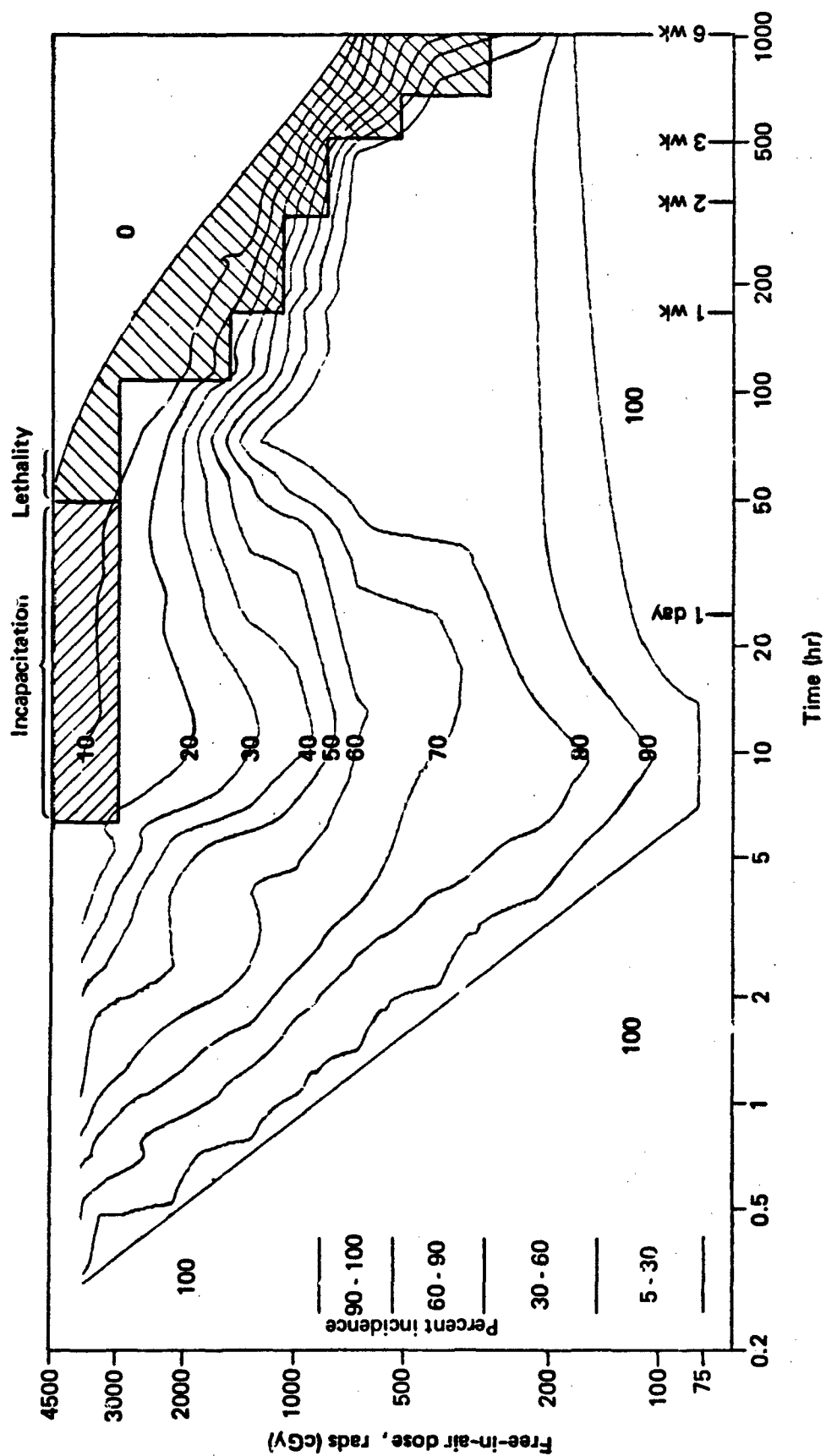


Figure 67. Performance contours, 10 percent performance intervals: tank crew, gunner.

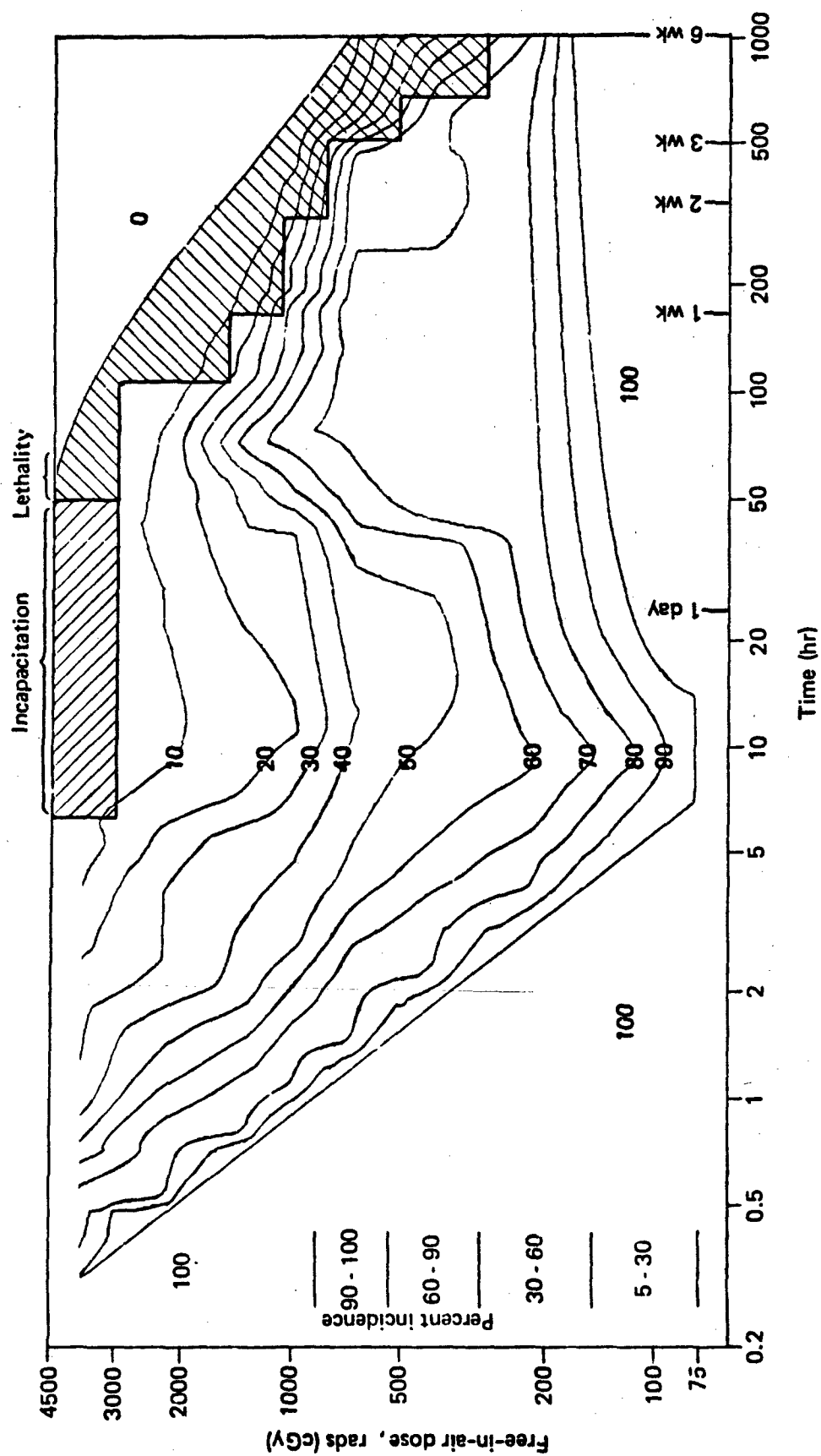


Figure 68. Performance contours, 10 percent performance intervals: tank crew, loader.

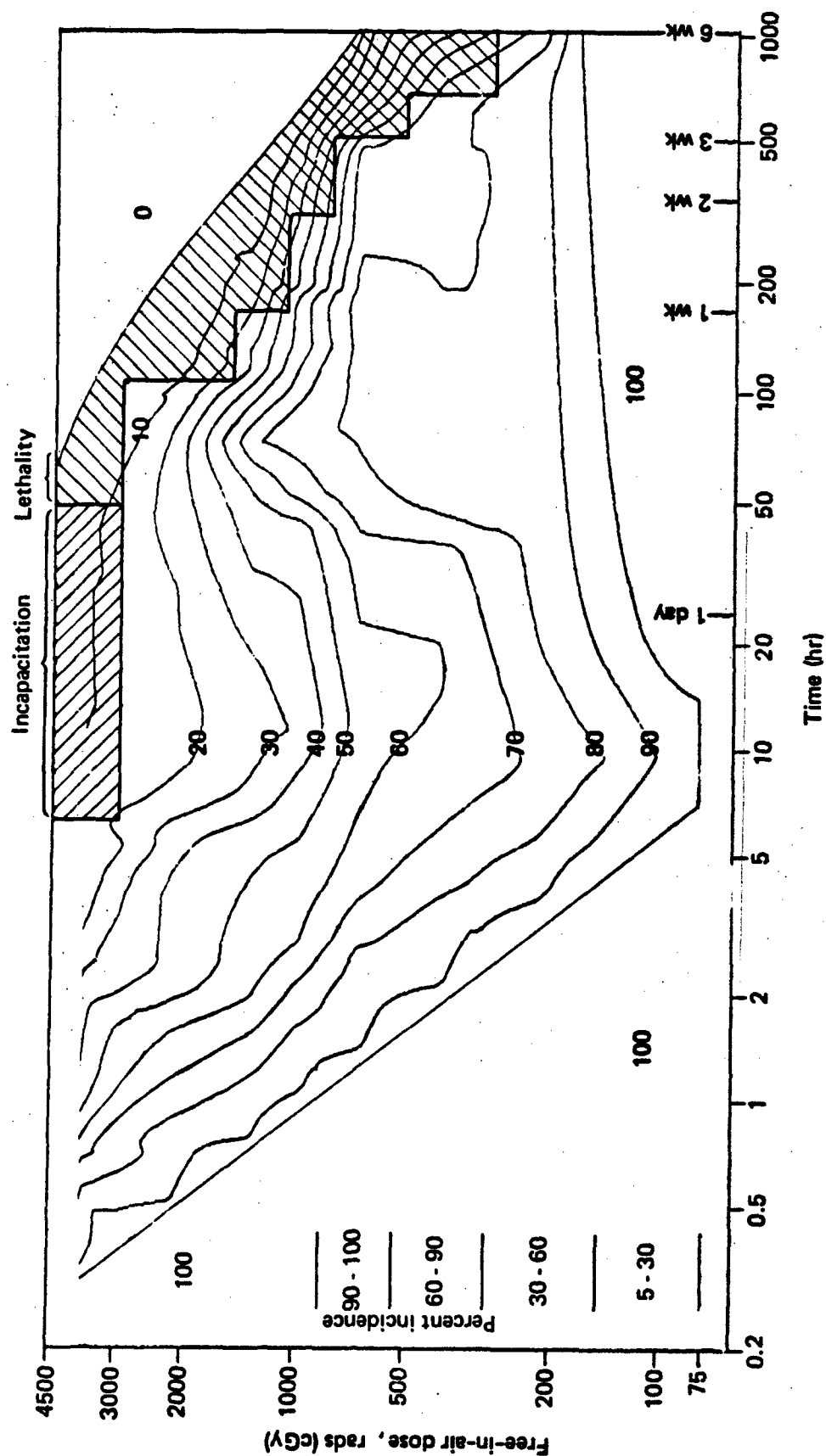


Figure 69. Performance contours, 10 percent performance intervals: tank crew, driver.

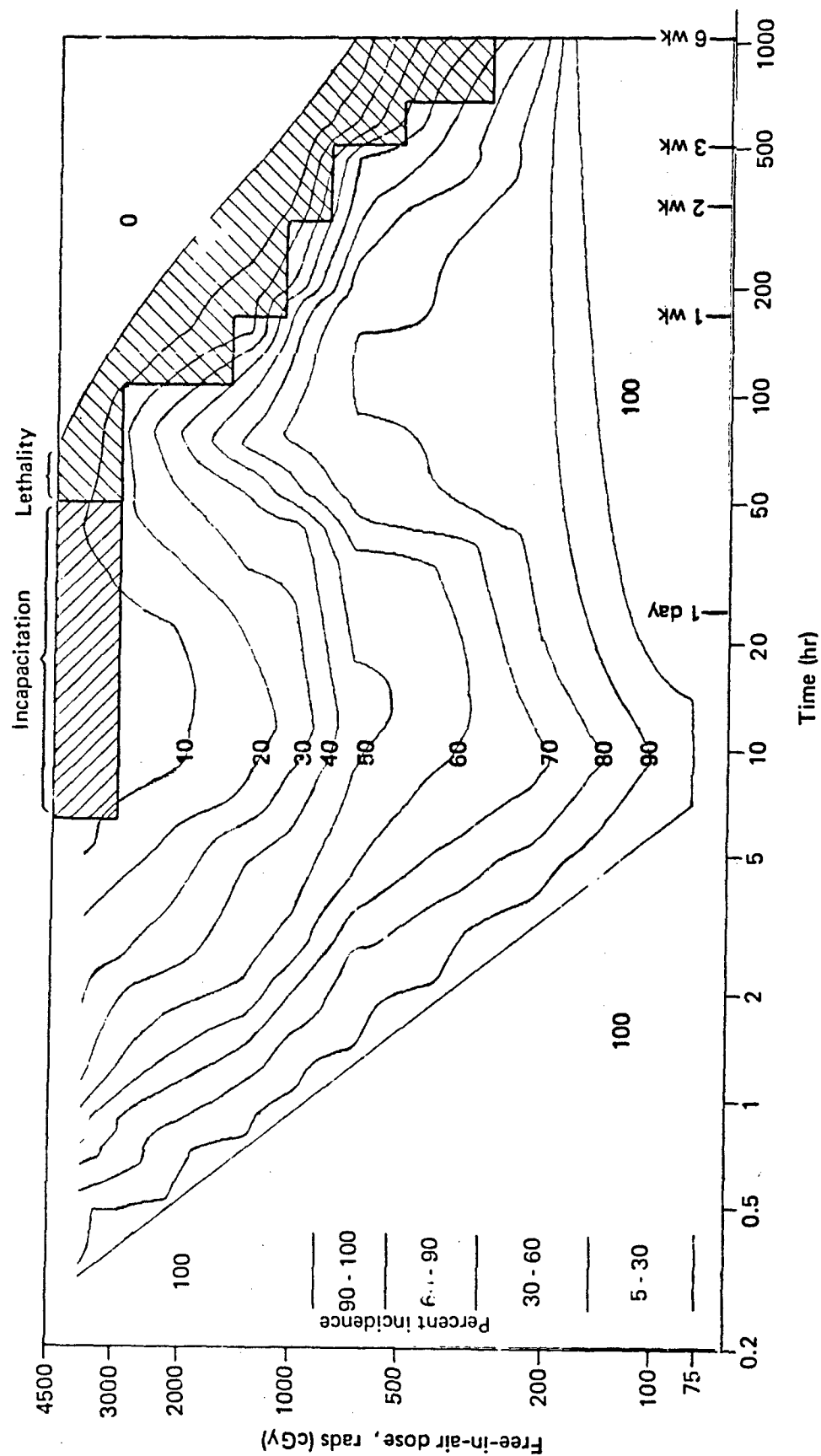


Figure 70. Performance contours, 10 percent performance intervals: TOW crew, squad leader.

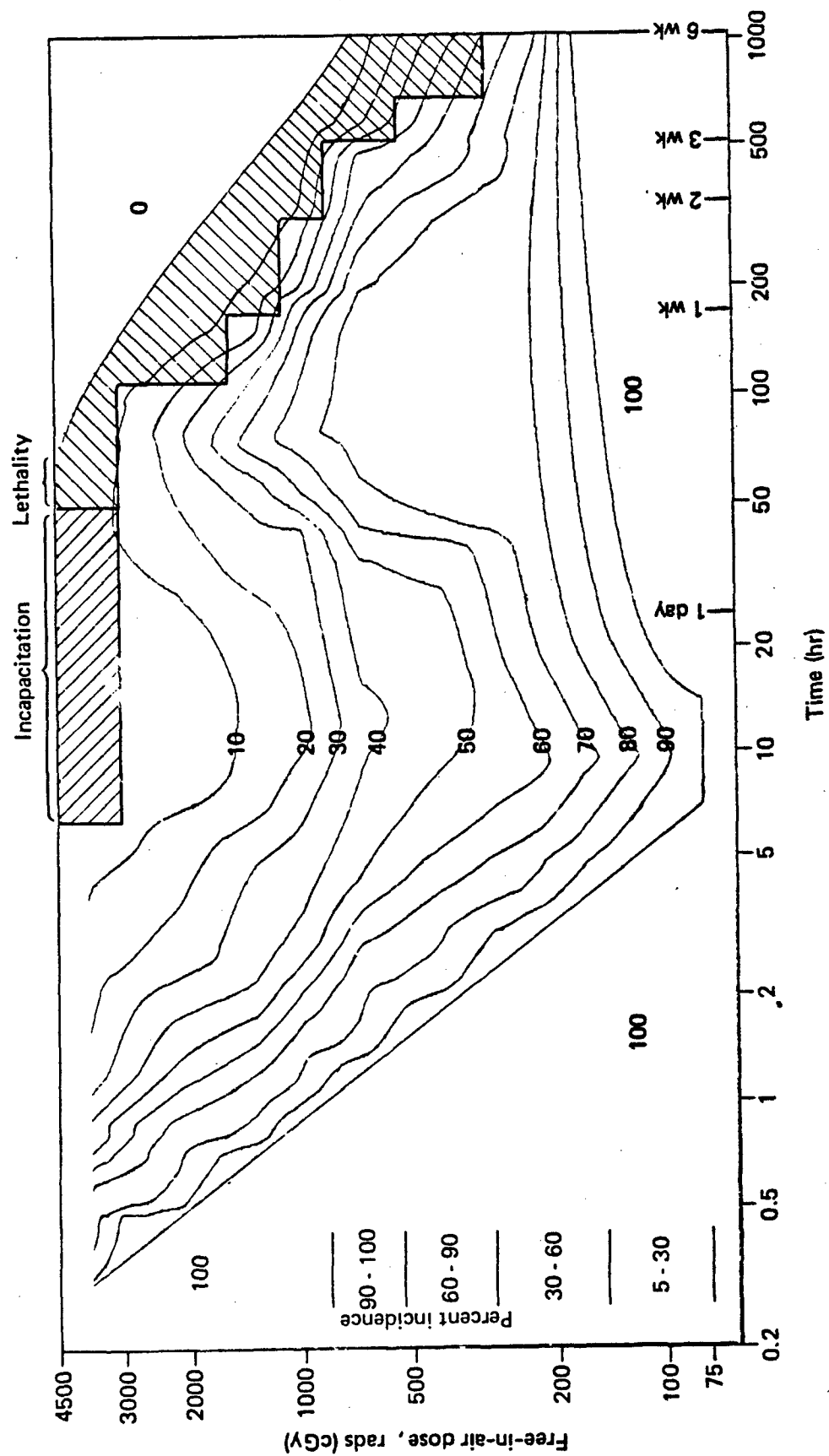


Figure 71. Performance contours, 10 percent performance intervals: TOW crew, gunner.

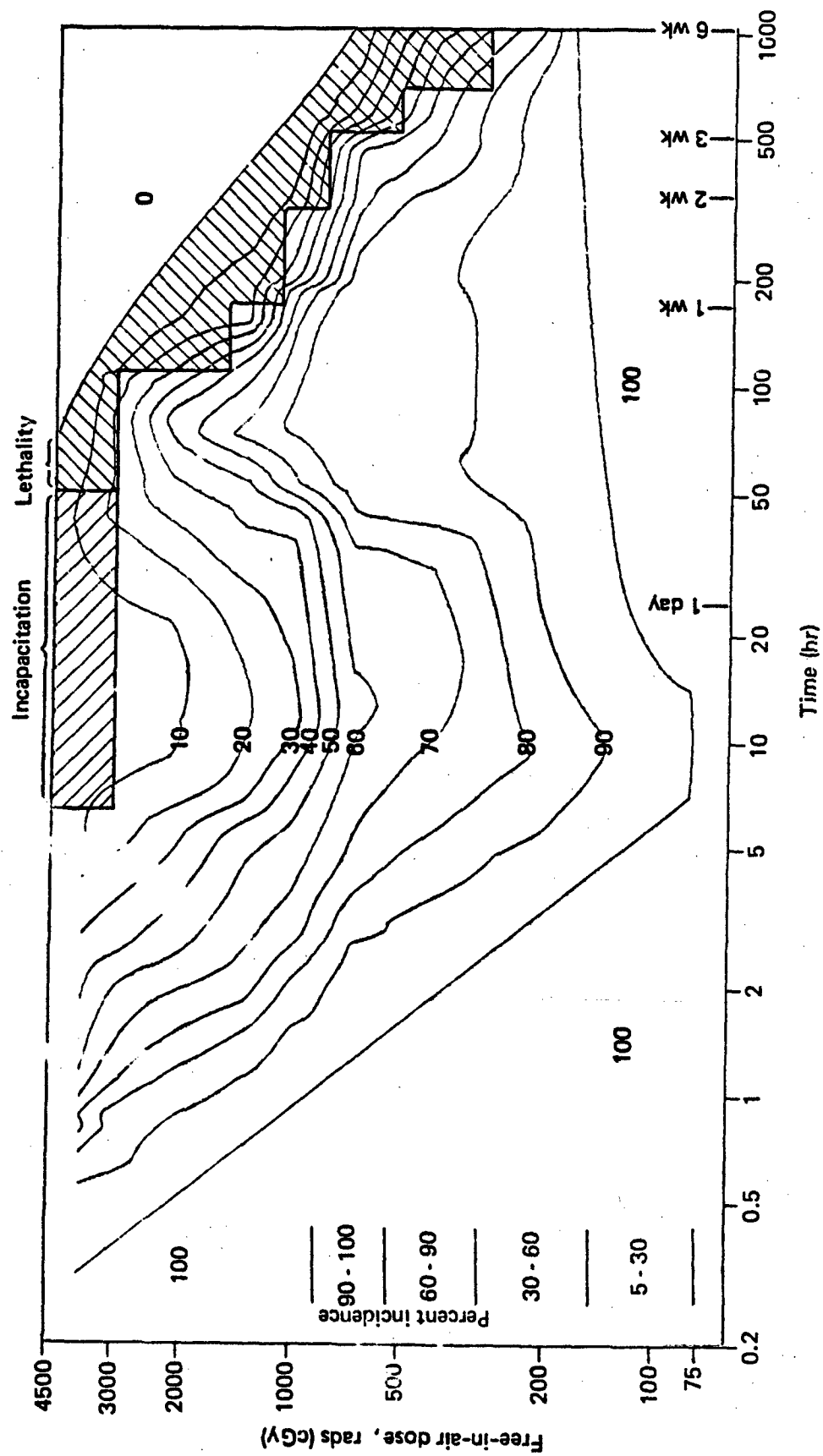


Figure 72. Performance contours, 10 percent performance intervals: TOW crew, driver.

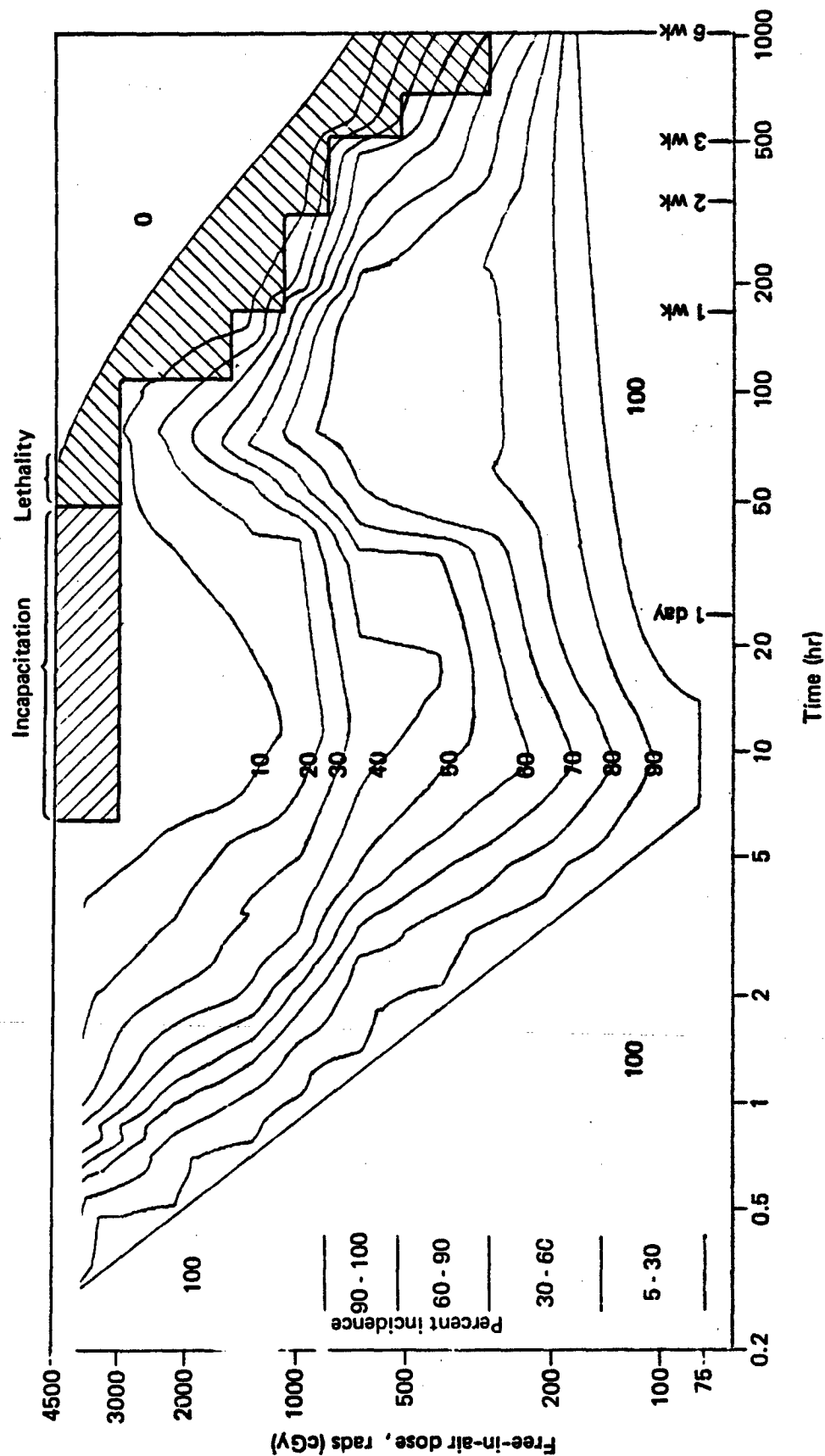


Figure 73. Performance contours, 10 percent performance intervals: TOW crew, loaded.

exposure based on Baum et al. [1983] which affect performance as indicated on the plots. The percent incidence is given along the left side of the plots for the designated dose ranges, commencing from 5 to 30 percent for the lowest dose range [75 to 150 rads (cGy)] and reaching 100 percent at and above 830 rads (cGy).

Any point along the isoperformance contour curves defines a dose level and postexposure time that correspond to the performance level of the contour. The performance profile over time, following exposure to a given dose, can be readily constructed from the performance contour plots by ascertaining the times where a given dose level intersects with the performance contour curves. For example, in Fig. 60 the estimated performance for the gun crew gunner exposed to 500 rads (cGy) would be 100 percent up to 1.5 hr following exposure; about 90 percent close to 1.8 hr; 80 percent at 3 hr; 70 percent at 4.5 hr; 60 percent at 10 hr; between 50 and 60 percent from 10 to 30 hr; 70 percent at 40 hr; between 70 and 80 percent from 40 hr to 2 weeks; etc.

The performance contour levels for all crewmember positions are constrained within a common dose/time boundary, since a uniform set of boundary conditions were specified [0 percent for the upper-right-hand corner and top of the 4500 rads (cGy) dose level, and 100 percent on the left-hand and bottom portions].

However, we point out here that the stairstep boundary beginning at 48 hr for the highest dose range [3000 to 4500 rads (cGy)] indicates where lethality commences [Baum et al., 1983] (see also Figs. 40 and 41). The time increment between the stairstep boundary and the outermost curve in the upper-right-hand corner, which we designate as the zero performance boundary for the performance level computations, represents the period over which the vast majority of lethalties would be expected to take place. Accordingly, we believe that although our computations indicate some level of performance in the period shown by the contour curves, they should be regarded with extreme caution. The authors also point out that the period extending from about 7 to 48 hr for the highest dose range [3000 to 4500 rads (cGy)] is spanned by symptom complexes (Figs. 40 and 41) that correspond to symptom descriptions including "exhausted with almost no strength," "faints upon standing quickly,"

"in shock," and "prostrate" [Anno and Wilson, 1983]. Again, the performance contours in that region, which we term as "incapacitation" in the contour plots, should be similarly regarded with caution. Also, along the upper portion of the plots between 0.4 and 5 hr, we have not connected the contour lines to the upper boundary at the 4500 rad (cGy) level. That region represents an area of relative uncertainty, because of the effect of the imposed boundary condition where there are no explicit data (discussed on p. 149).

Along the left-hand edge of the contour plots near the boundary, the wave-like appearance of the 80 to 90 percent performance contour lines, as well as the 70 percent line for some cases, are a consequence of the selected discrete dose range structure (see Sec. 4) and the numerical mapping procedure described in Sec. 5. For convenience, those portions of the contour lines could be considered as straight lines, running diagonally between the "peaks and valleys," and be well within the uncertainty of the calculated values.

Differences in performance among the various crewmembers are more noticeable in the contour plots than in the three-dimensional surface plots. For example, let us examine the contour differences between the gun crew loader in Fig. 62 and the FDC crew computer in Fig. 65, which represent two extreme cases. The gun crew loader performs the most physically demanding set of tasks, which includes loading the heavy (about 100 lb) artillery projectile, whereas the computer in the FDC crew performs the least physically demanding tasks, which include selecting tabulated numerical data, performing computations with a hand-held calculator, and verbally communicating data.

CREWMEMBER ROLE GROUPS

Graphical comparisons of the performance contours have been made by dividing the 15 combat crewmembers into five different groups based on the similarity of combat tasks they perform in each crew; the five groups and crewmembers included in each are shown in Table 31. The numbers in the column labeled "Identification" help in labeling the plots discussed below. The last group listed, FDC, consists of the horizontal control

Table 31. Crewmember groups.

Group	Crewmember	Identification
Leader	Artillery--chief of section	1
	FDC--fire direction officer	5
	Tank--tank commander	8
	TOW--squad leader	12
Gunner	Artillery--gunner	2
	Artillery--assistant gunner	3
	Tank--gunner	9
	TOW--gunner	13
Loader	Artillery--loader	4
	Tank--loader	10
	TOW--loader	15
Driver	Tank--driver	11
	TOW--driver	14
FDC	FDC--horizontal control operator	6
	FDC--computer	7

operator and the computer. Those crewmembers primarily perform cognitive, or the least physically demanding tasks. Graphical comparisons are made by plotting the contours for each of the five groups separately for three different performance levels: 30, 50, and 70 percent.

Thirty Percent Performance

Figures 74 through 78 are plots of the five groups at the 30 percent performance level. Figure 74 shows a fairly close grouping over dose and time with the fire direction officer generally at somewhat higher dose levels. Figure 75 shows a close grouping between the gunner and assistant gunner of the artillery crew, which makes sense, since they both perform essentially similar tasks. The tank and TOW gunners are at the high and low dose extremes, respectively. The loaders in Fig. 76 show a fairly consistent pattern--at least over the first two days following exposure--where the 50 percent performance level for the artillery, TOW, and tank loaders, respectively, are each at decreasing dose values. Since much of the loaders' tasks consist of handling

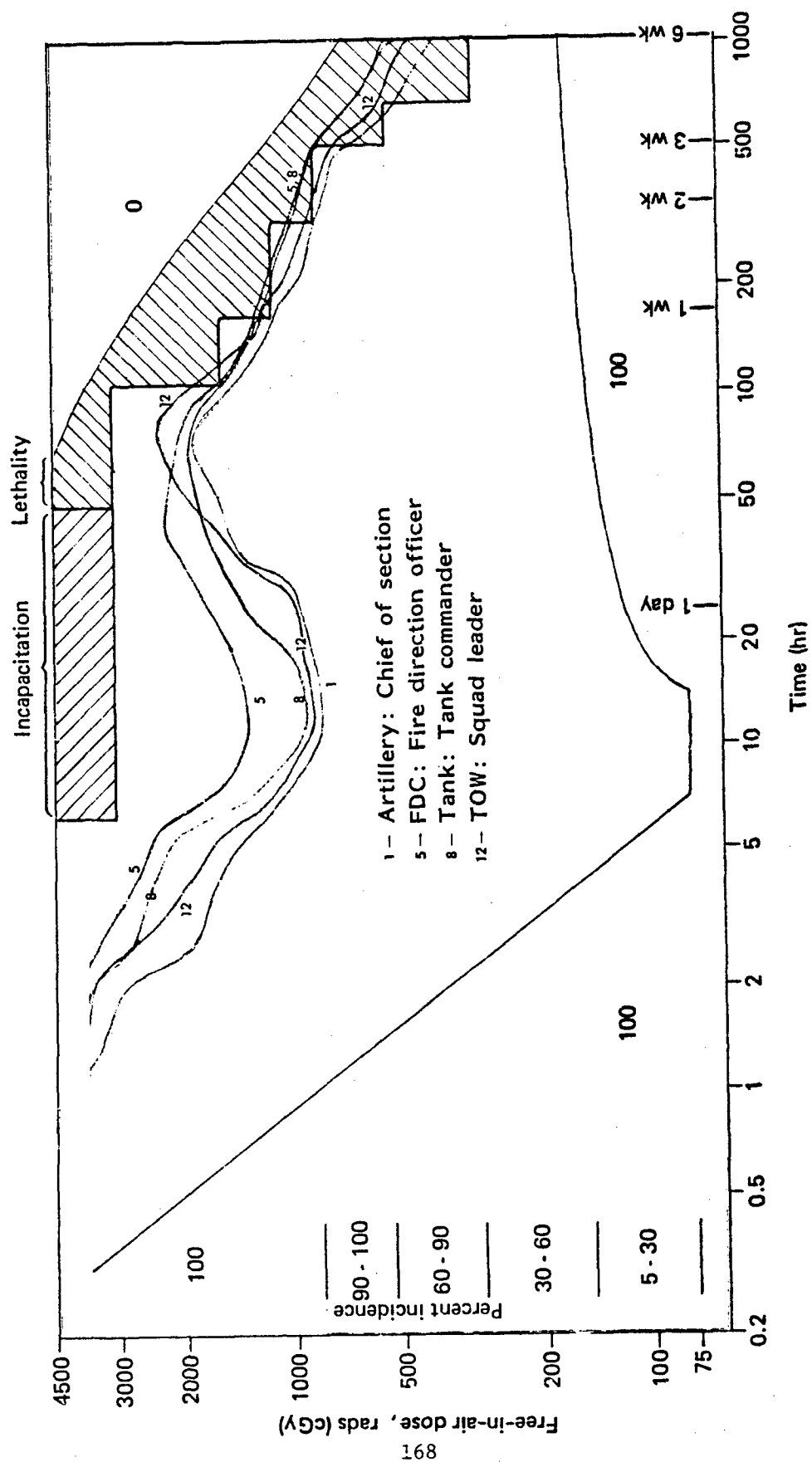


Figure 74. Crew leaders, 30 percent performance.

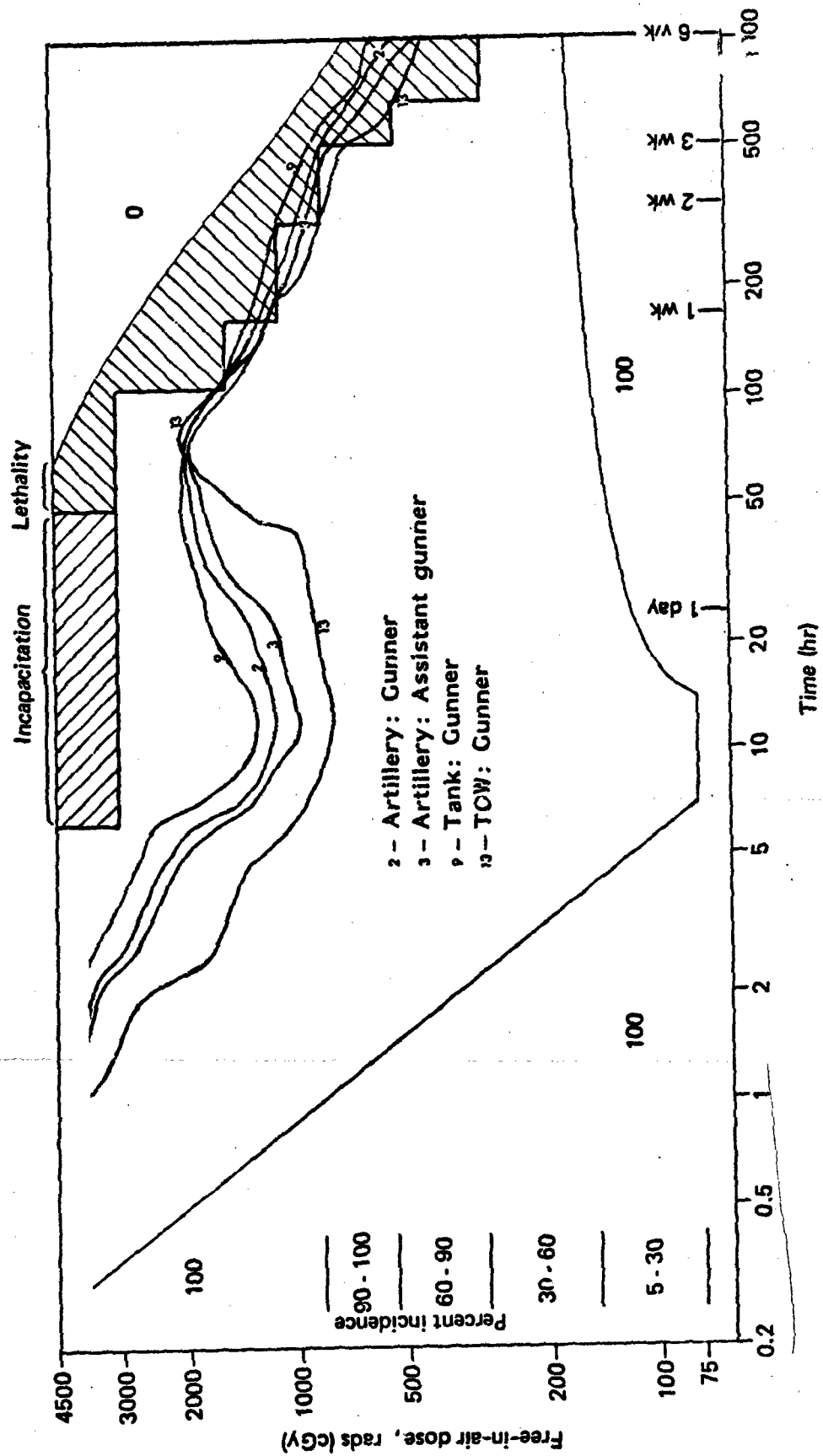


Figure 75. Crew gunners, 30 percent performance.

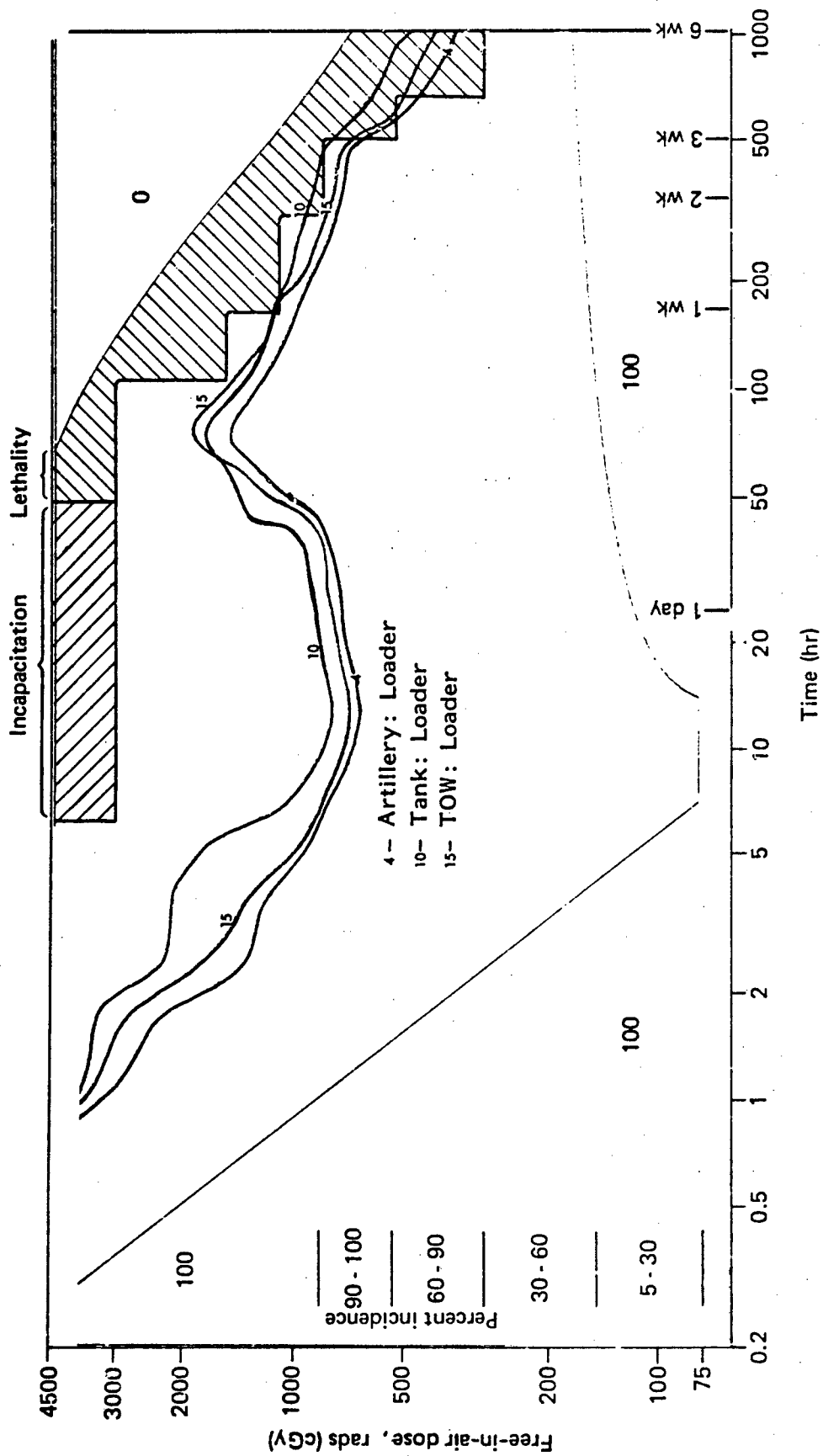


Figure 76. Crew loaders, 30 percent performance.

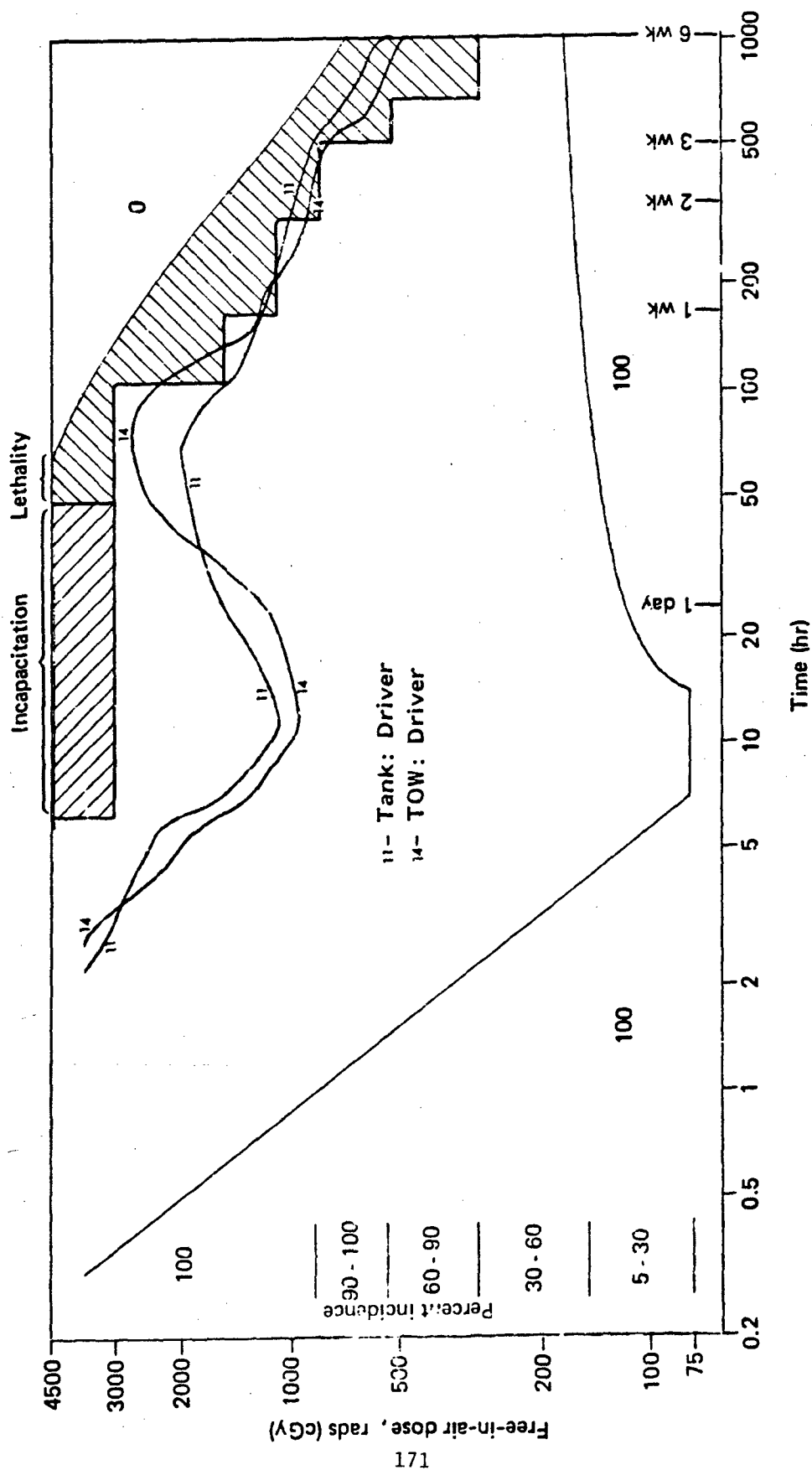


Figure 77. Crew drivers, 30 percent performance.

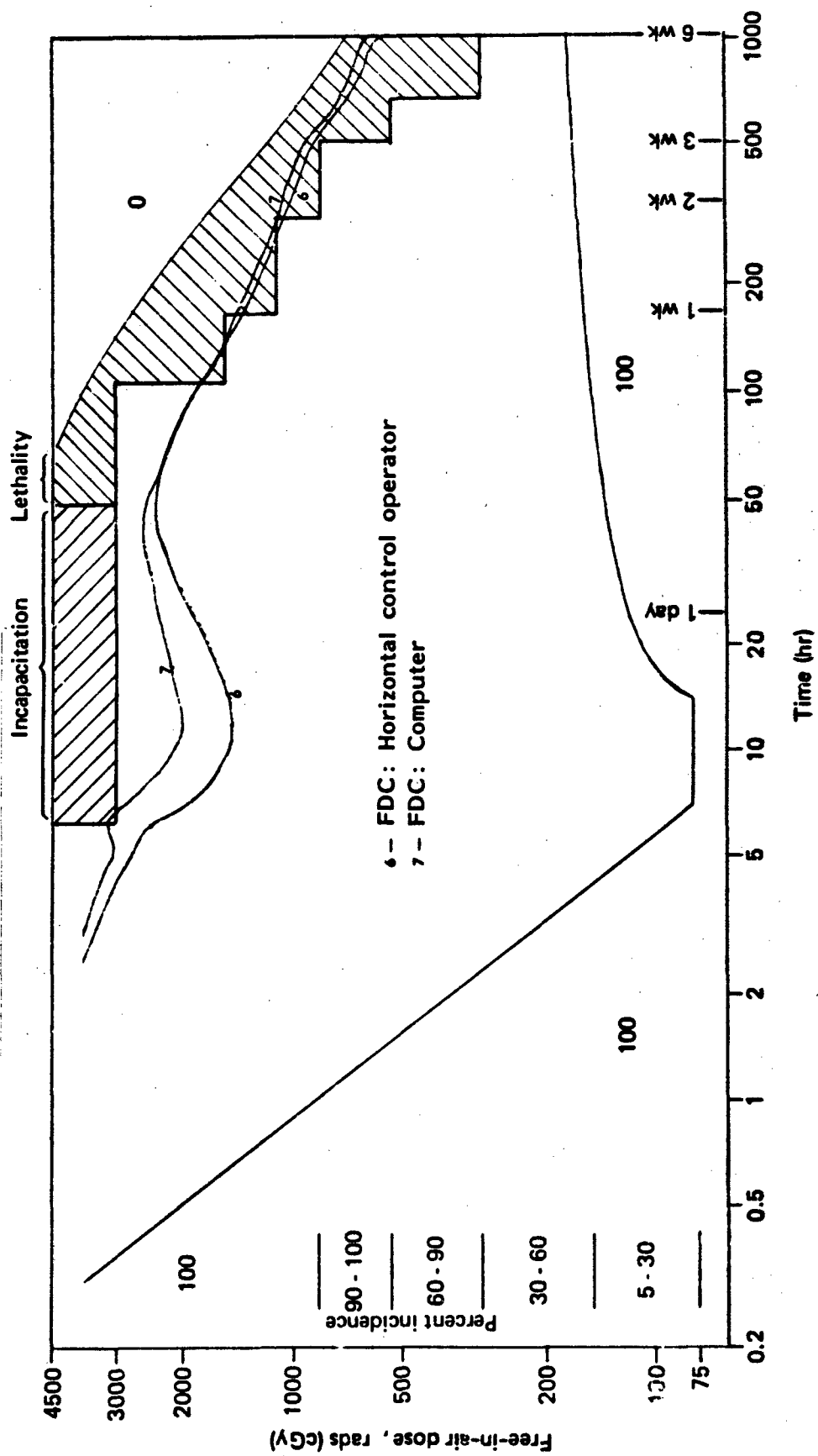


Figure 78. FDC crew, 30 percent performance.

munitions, the order of difficulty and the decreasing order of affecting dose are consistent with the weight of the munition, i.e., the artillery loader handles a 100 lb projectile, the TOW loader a 54 lb missile, and the tank loader a 30 lb projectile.

Figure 77 indicates a fairly close contour resemblance for the tank and TOW drivers except between about one and one-half to several days, where the TOW driver appears to require a somewhat higher dose to reduce performance to 30 percent. Figure 78 shows the two crewmembers that require the highest dose to reduce performance to 30 percent; as previously mentioned above, they have the least physically demanding tasks. In particular the computer is shown to be the least affected dosewise.

Fifty Percent Performance

The 50 percent performance contours for the five groups of crewmembers are given in Figs. 79 through 83. At this level, there is a relative widening of all the performance contours compared to the 30 percent level with the exception of the drivers in Fig. 82, which even become comparatively narrower. The widening is most apparent in the deviation toward lower doses of the artillery chief of section, TOW gunner, and artillery loader relative to the others in their respective groups. That is, lower doses that produce 50 percent performance, as compared with higher doses that produce 30 percent performance, have a relatively greater effect on performance for those positions as compared with the others in their respective groups. Such a widening effect is also seen for the horizontal control operator/computer group. However, since there are only the two members in the group, it is not readily apparent from the plots which position accounts for the widening. The driver group does not show the widening effect when comparing the 30 percent and 50 percent performance contours.

In Fig. 79, performance contours for the leaders of the tank and TOW crews are essentially the same, whereas the fire direction officer requires the highest dose and the artillery chief of section requires the lowest dose to be affected at the 50 percent performance level. The relative position of the contour for the chief of section is somewhat

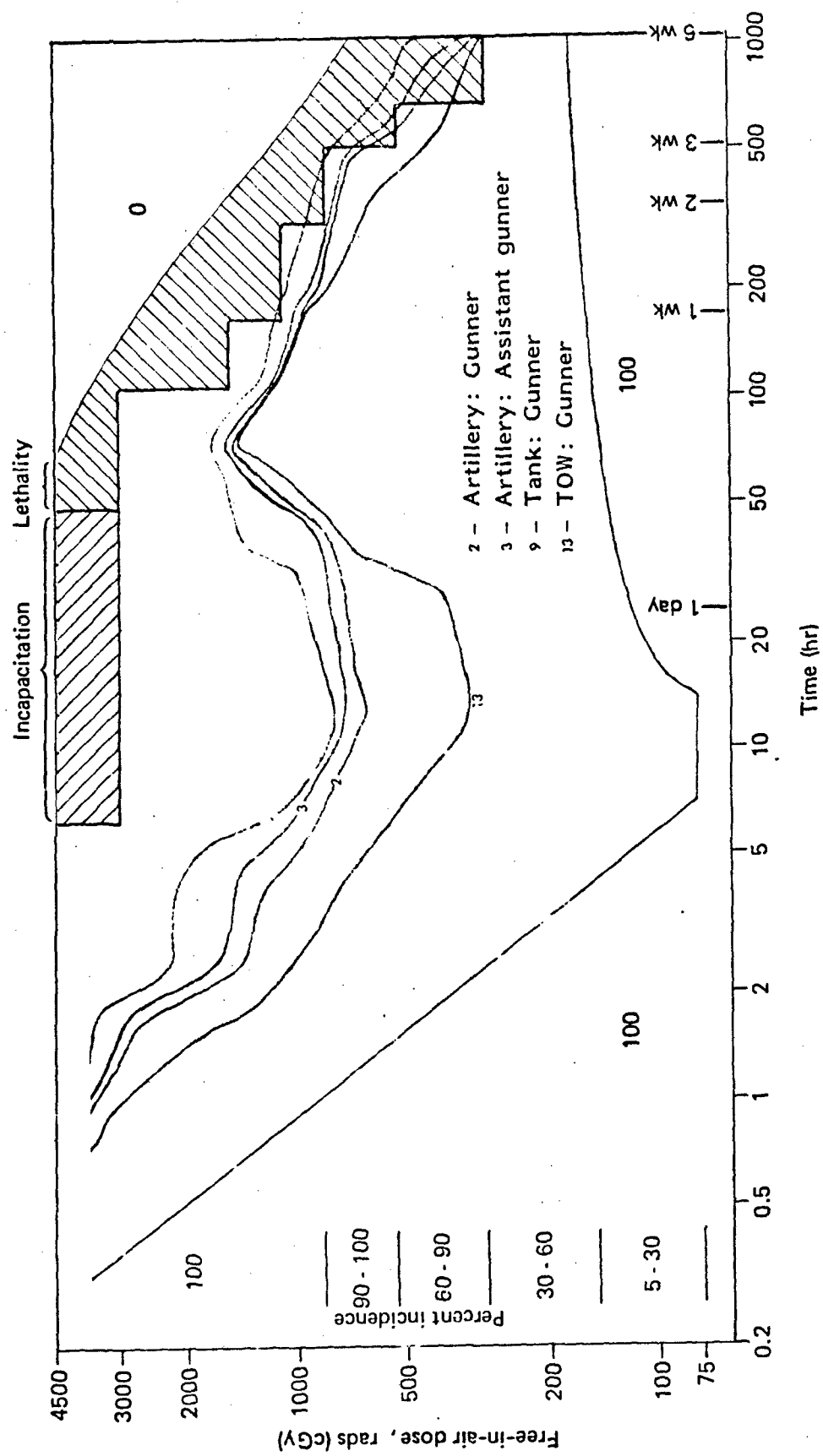


Figure 80. Crew gunners, 50 percent performance.

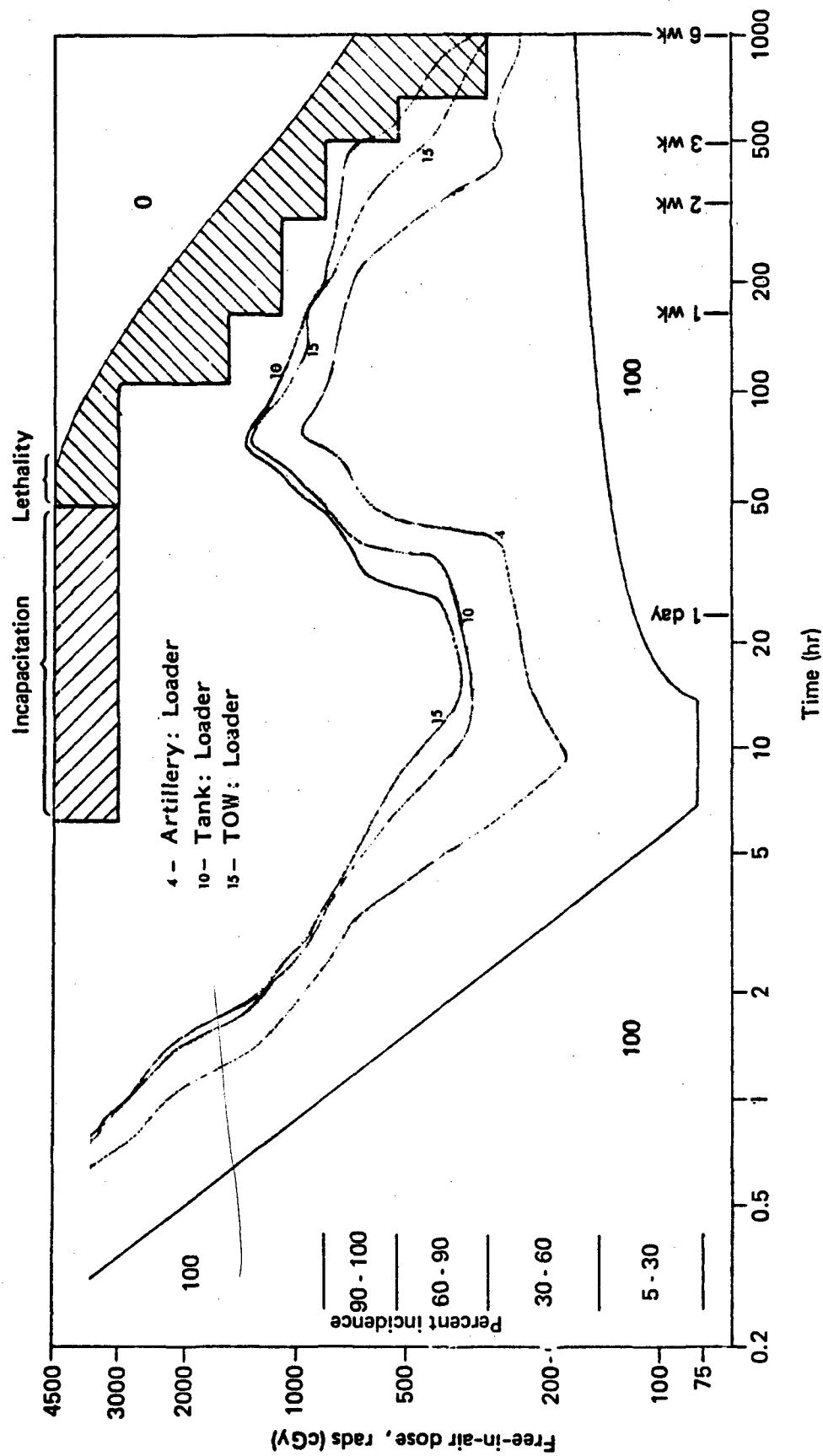


Figure 81. Crew loaders, 50 percent performance.

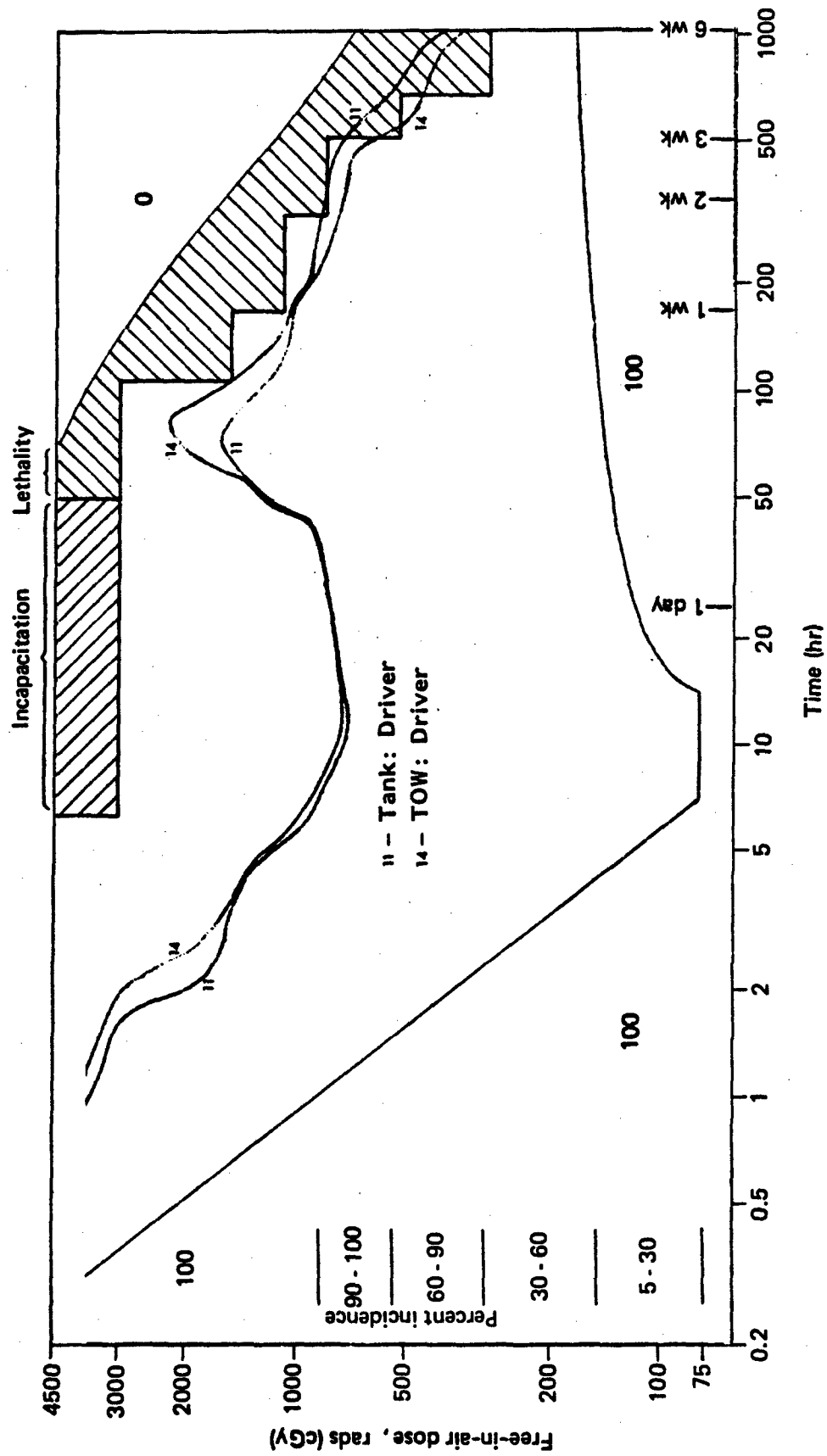


Figure 82. Crew drivers, 50 percent performance.

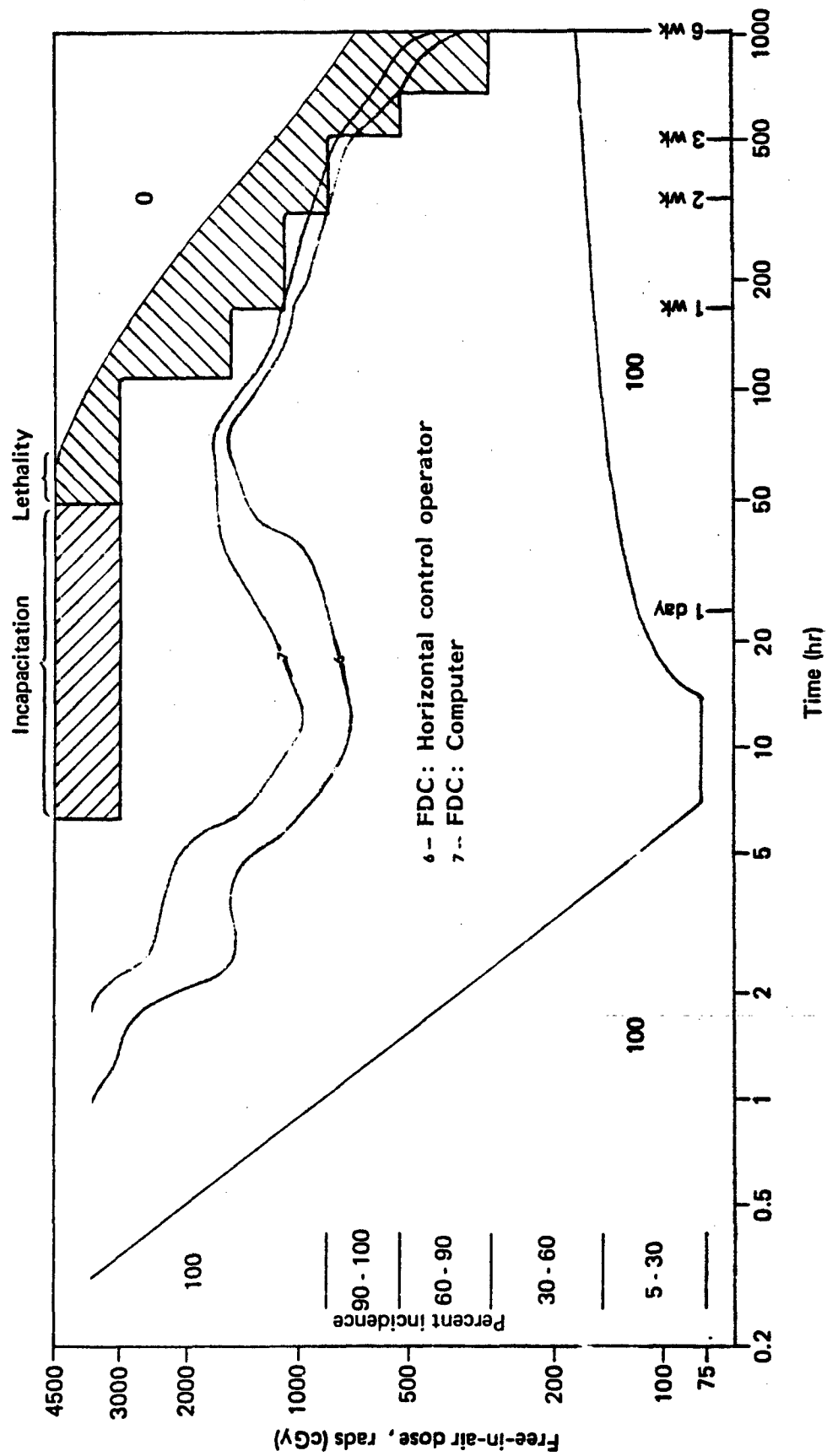


Figure 83. FDC crew, 50 percent performance.

contrary to expectations when, realizing that compared with others, his tasks are no more demanding. Moreover, like the fire direction officer, his tasks are performed while stationary as compared with the tank commander and TOW squad leader who are mobile--a situation that can aggravate the symptoms associated with acute radiation sickness.

Relatively smaller doses reduce the level of performance of the TOW gunner to 50 percent as compared with the other gunners (Fig. 80); the tank gunner requires the highest dose to be at the 50 percent performance level. As would be expected, the performance of the artillery loader is reduced to 50 percent at lower doses compared to the tank and TOW loaders, as shown in Fig. 81. Again, as shown in Fig. 83, the FDC group appears to be among the least affected dosewise, with the computer requiring the highest dose to reduce performance to the 50 percent level.

Seventy Percent Performance

The 70 percent performance contours are given in Figs. 84 through 88. Again, the relative contour positions are similar to the 50 percent performance levels although at lower doses. As shown in Fig. 84, the significant relative deviation to lower doses of the chief of section from the others in the leader group is again somewhat puzzling; this becomes particularly more apparent for times between a couple of days to a couple of weeks. At the 70 percent level, the tank gunner shown in Fig. 85 appears not to be affected until relatively higher doses compared with the other gunners. At the 70 percent performance level, again, the artillery loader is affected at relatively lower doses as shown in Fig. 86. Noteworthy are the low dose levels that reduce performance to 70 percent commencing within a few hours following exposure. Figures 87 and 88 show a relative widening of the performance contour compared to the 50 percent performance level for the driver and FDC groups, respectively.

Contour Plot Summaries--30, 50, and 70 Percent Performance

Graphical summaries for 30, 50, and 70 percent performance contour levels for all five groups are shown in Figs. 89 through 91. In those

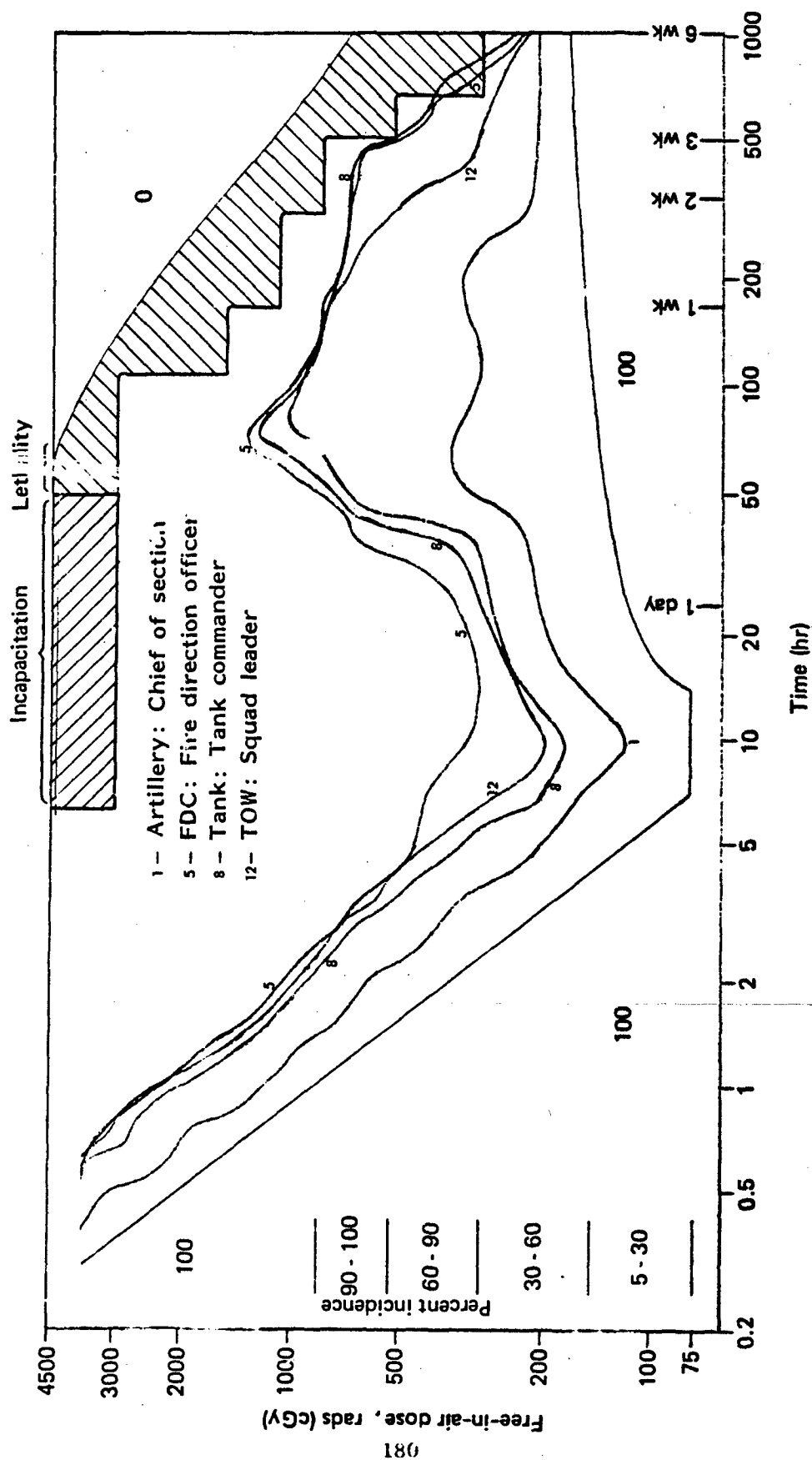


Figure 84. Crew leaders, 70 percent performance.

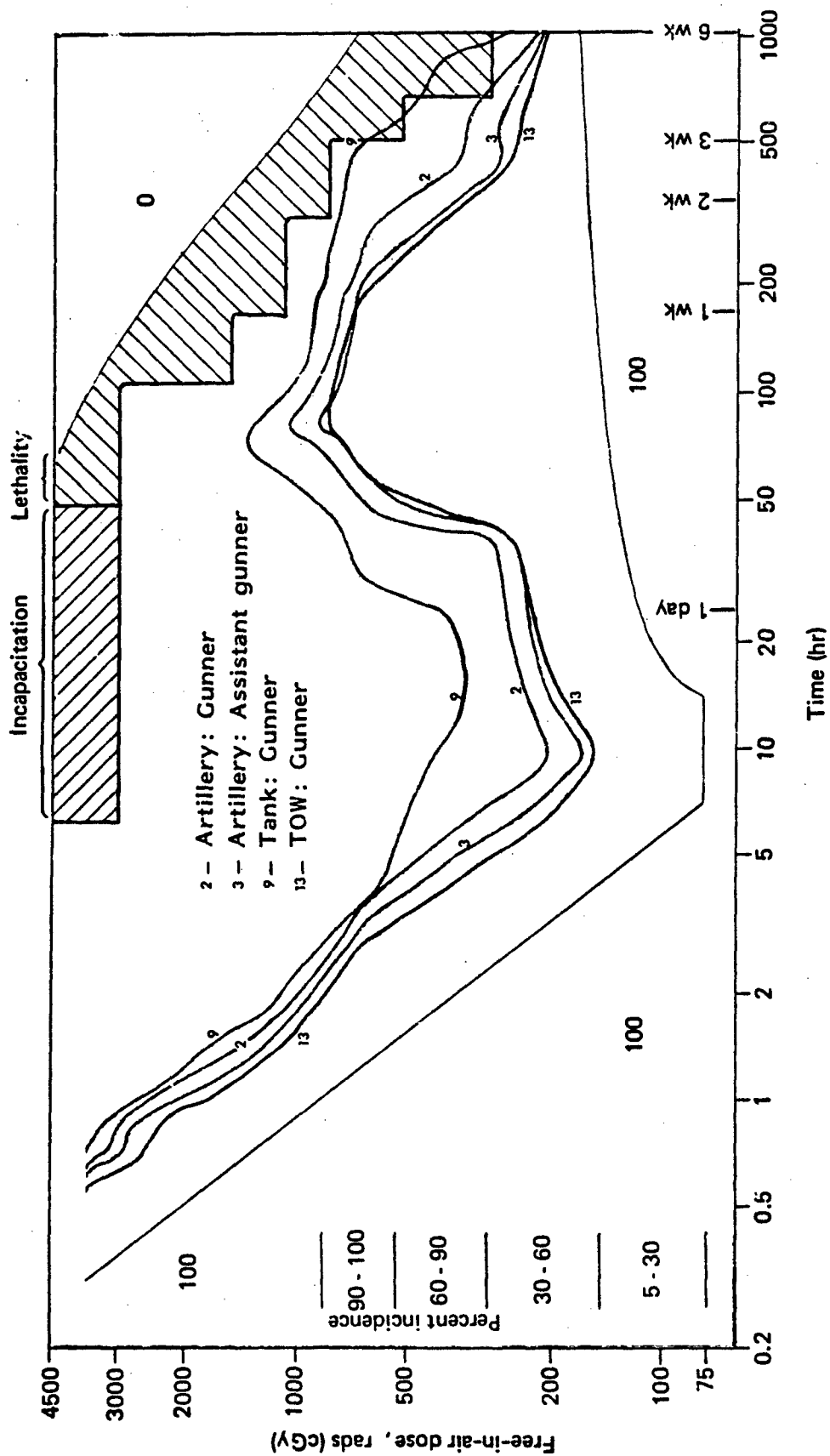


Figure 85. Crew gunners, 70 percent performance.

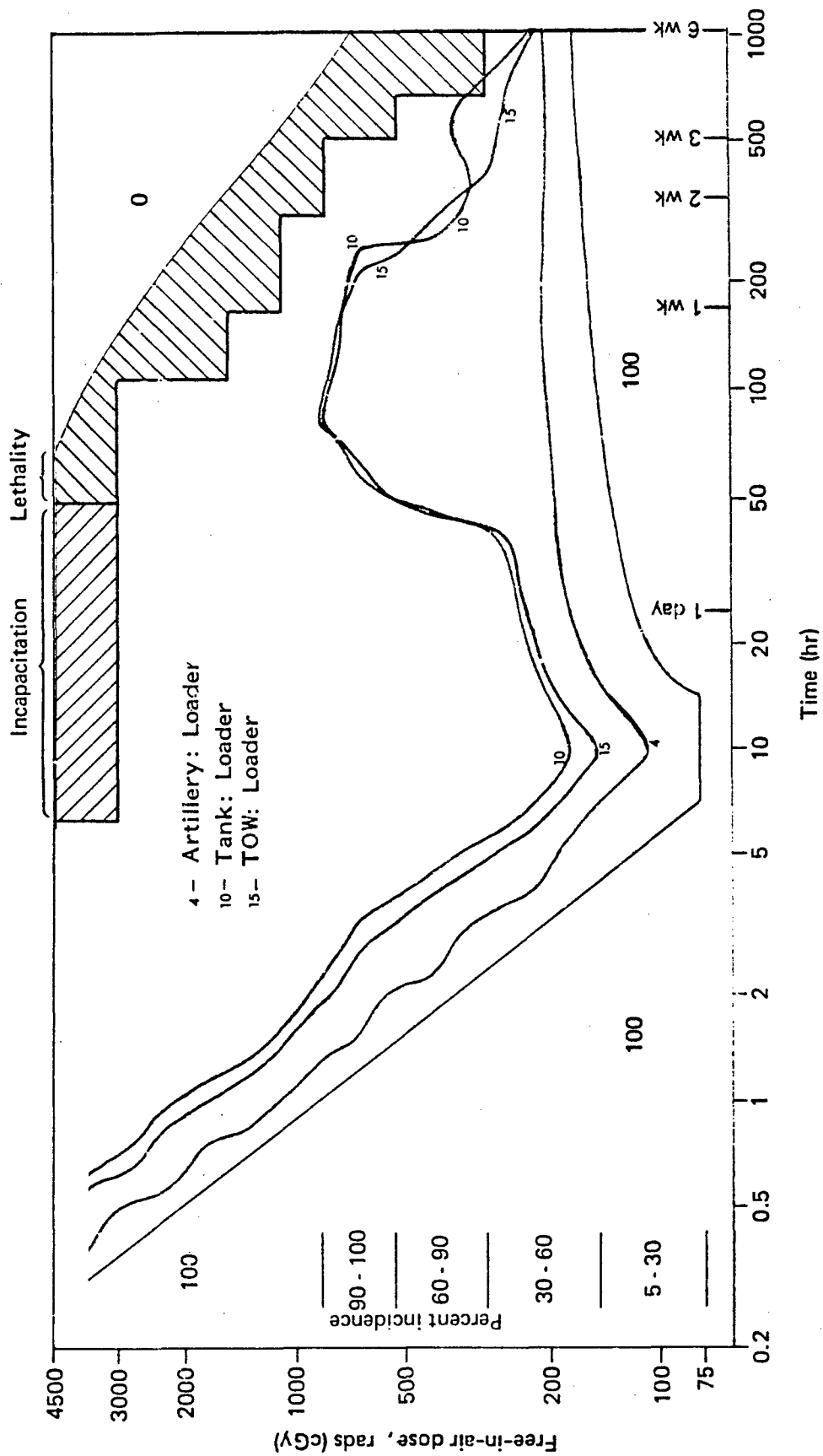


Figure 86. Crew loaders, 70 percent performance.

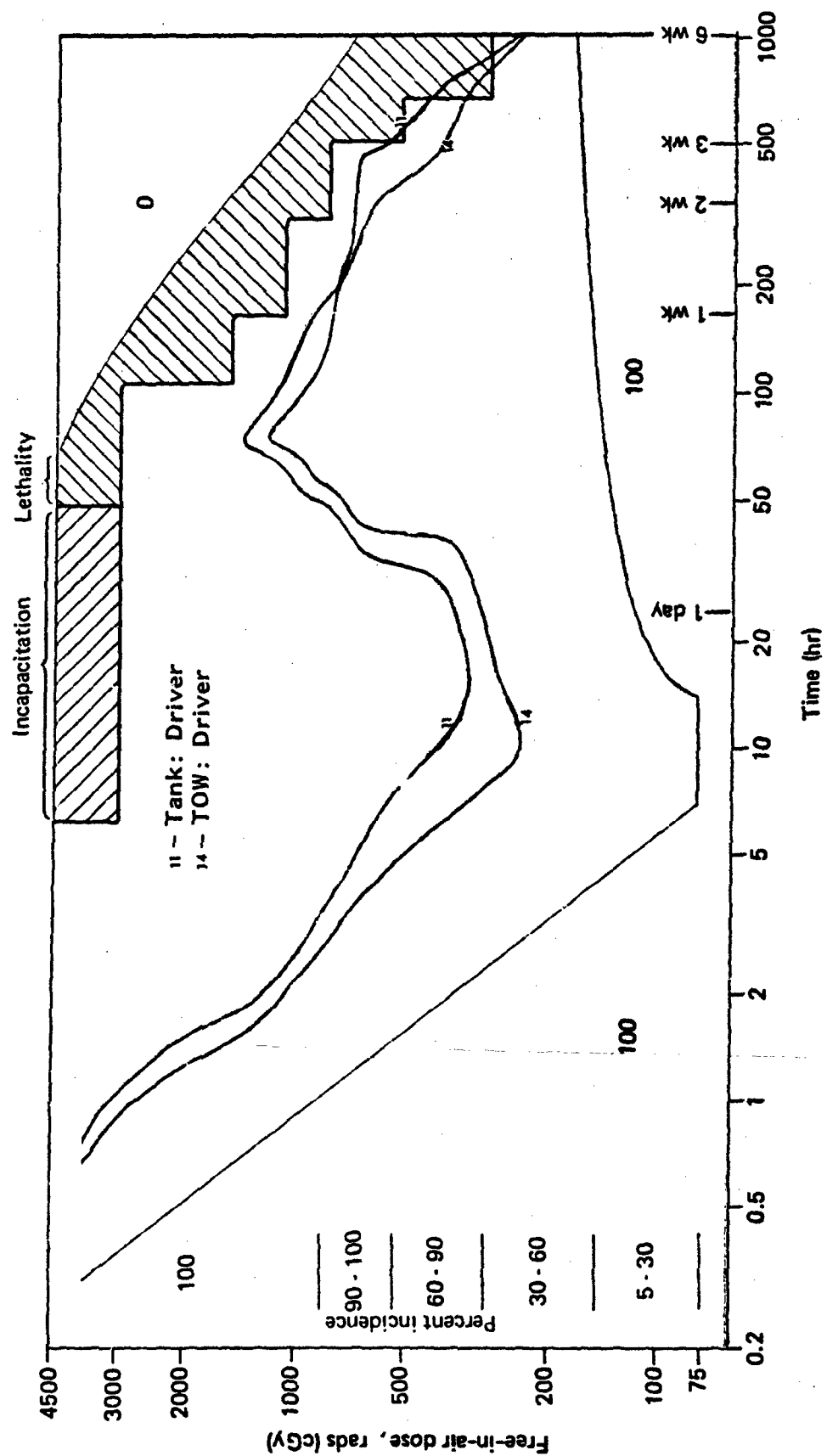


Figure 87. Crew drivers, 70 percent performance.

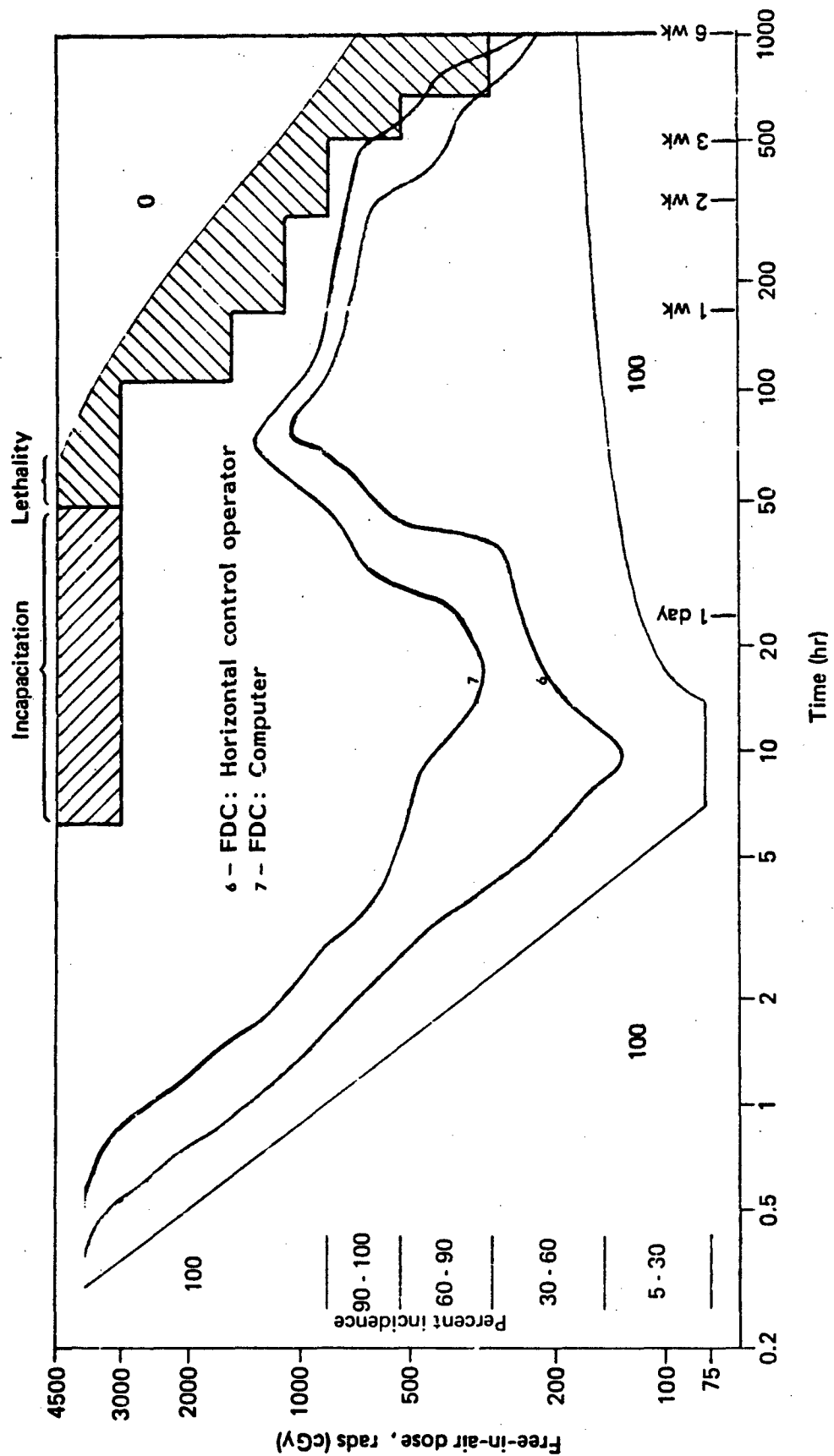


Figure 88. FDC crew, 70 percent performance.

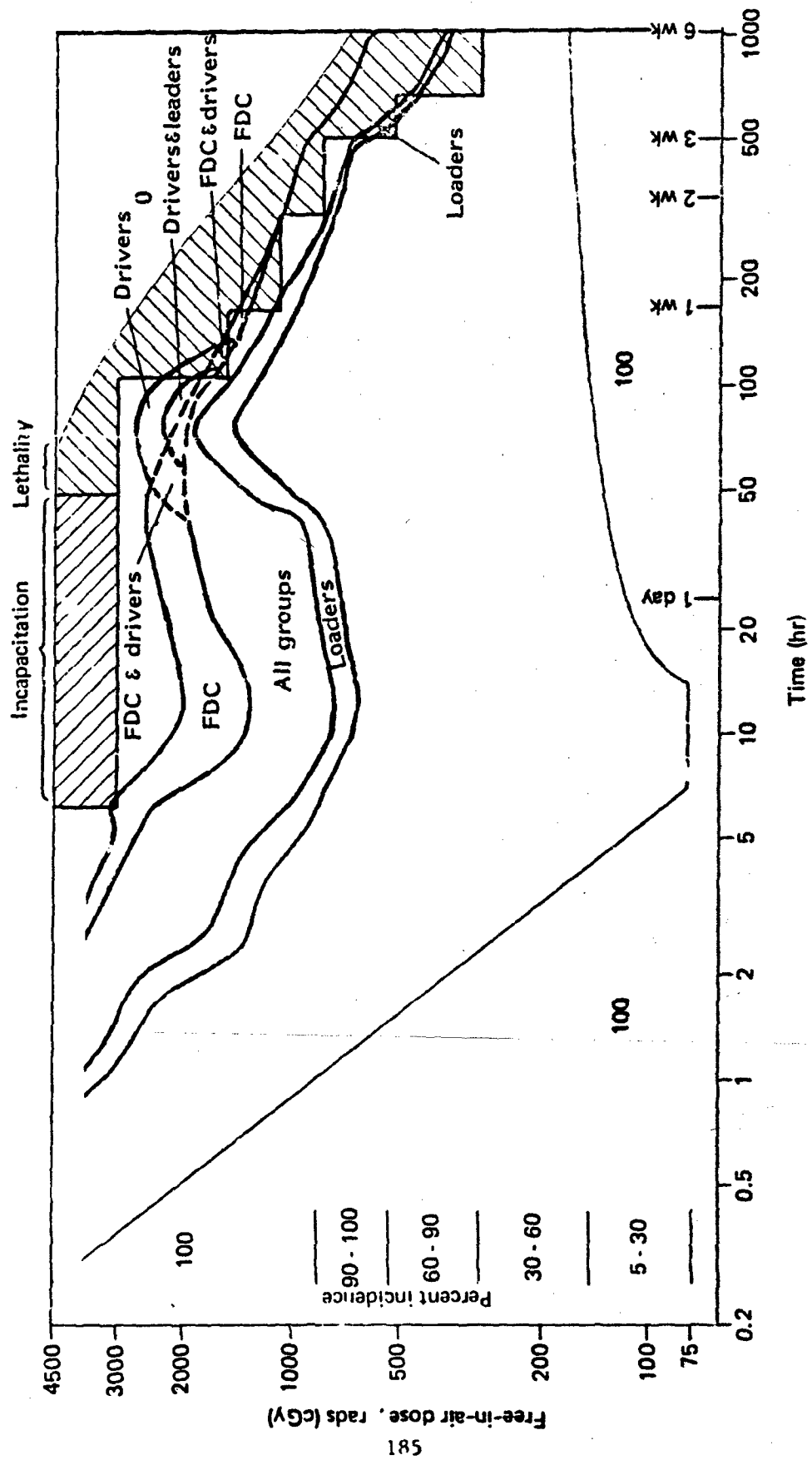


Figure 89. Summary of 30 percent performance.

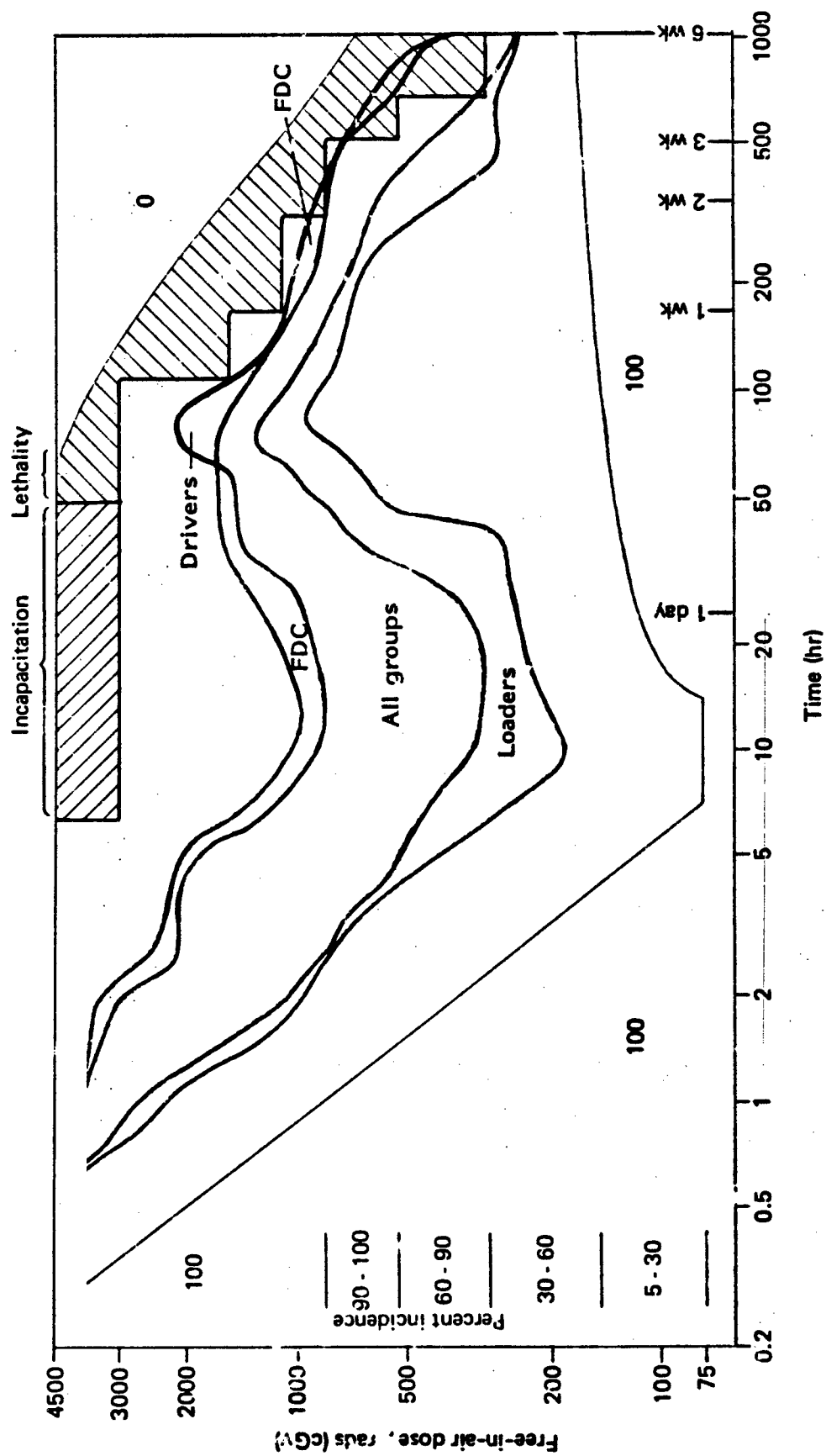


Figure 90. Summary of 50 percent performance.

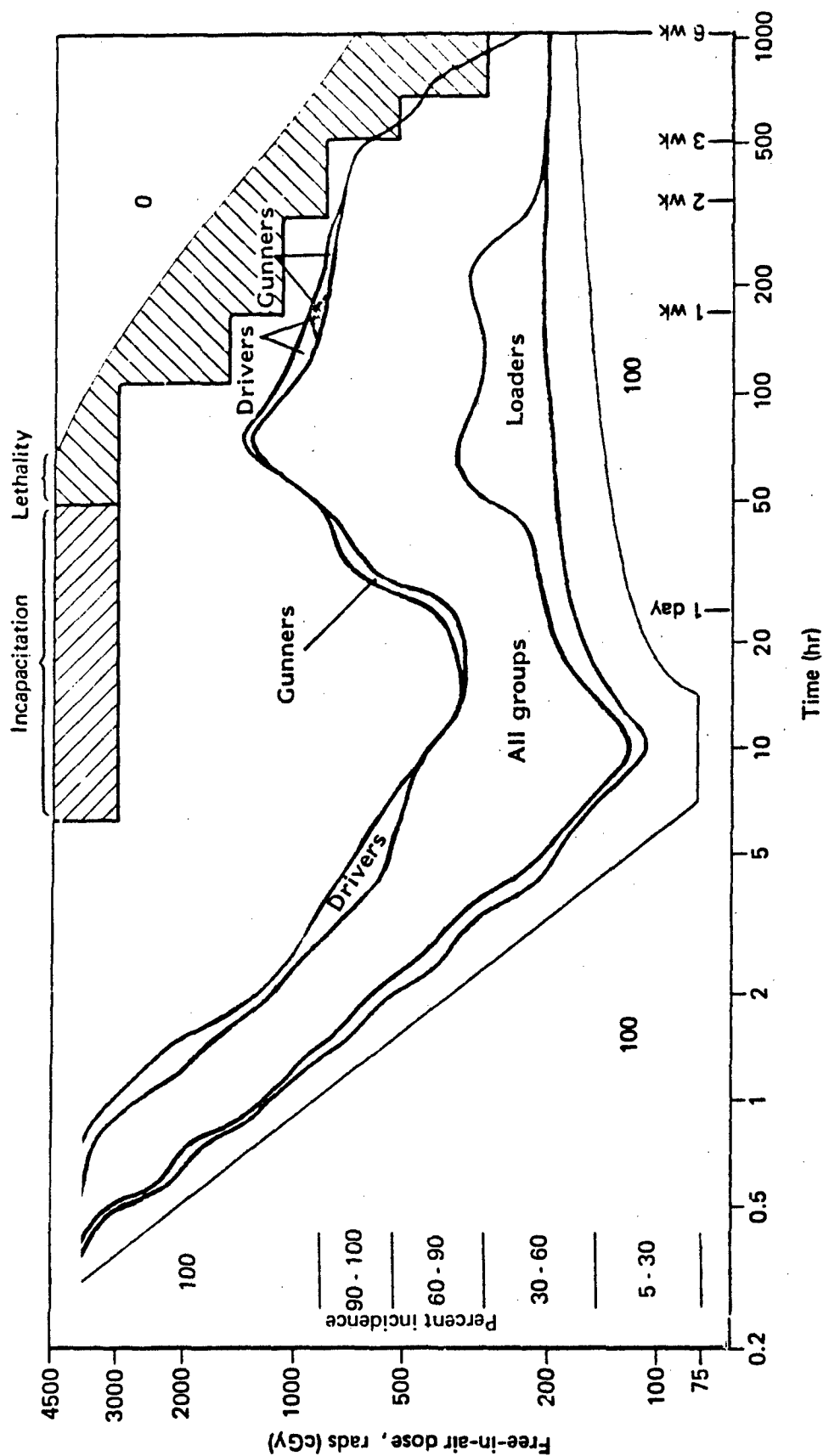


Figure 91. Summary of 70 percent performance.

figures, we show isoperformance bands represented by any groups formed by the two outer level contours. For example in Fig. 90 the lowermost band labeled "Loaders," includes only loaders; the uppermost band labeled "FDC" includes only FDC crew positions. In one region, the uppermost band labeled "Drivers" includes only drivers. The middle band labeled "All Groups" is composed of all other groups, although some loaders, FDC crewmembers, or drivers could also be included because the outermost isoperformance contours represent their respective group extremes. In the interest of clarity, we have not presented a more extensive collection of performance profiles.

The contour summaries all show the meandering band pattern, reflecting the period of remission between initial prodromal symptoms and manifest illness [Baum et al., 1983], which becomes less apparent with decreasing performance level, i.e., with increasing dose. At the 30 and 50 percent performance levels, the middle band, which includes all groups, is bordered primarily by the loaders on the low dose and the FDC group on the high dose end, except for the few "outcroppings" of other groups between about 50 and 100 hr following exposure. There the drivers compete with the FDC group for the high dose values. At the 70 percent level, the loaders border the low dose side of the middle band that includes all groups, whereas the drivers and gunners alternatively form the border at the high dose end rather than the FDC group. Any particular reason for outcropping is not apparent.

Some generalizations regarding performance can be made from Figs. 89 through 91. A dose of at least 500 rads (cGy) is required to reduce performance levels of all groups to 30 percent 2 weeks following exposure. Doses of from only about 150 to 350 rads (cGy) reduce the performance of the loader group to 50 percent between a few hours to a couple of days following exposure; the performance of other groups are reduced to 50 percent during the same period after high exposures--from about 350 rads (cGy) to about 1100 rads (cGy). Doses from about 130 rads (cGy) reduce performance of all groups to 70 percent from a few hours to a couple of days following exposure. Doses as low as 100 rads (cGy) reduce performance for the artillery gun crew loader and chief of section to 70 percent between several to about 15 hr following exposure.

CONFIDENCE BOUNDS--CONDITIONAL MEAN PERFORMANCE

The approximate 95 percent confidence bound (L_{95}) of the performance predictions given by the regression relationships are indicated in Fig. 92. The values presented are based on the variance of the conditional mean ($\hat{\sigma}_m^2$) as predicted by the regression relationships given in Sec. 3. The L_{95} values represent the average percent deviation from the predicted (mean) value for the 95 percent confidence bound (Student's t-distribution) given as follows:

$$L_{95} = \frac{\frac{1}{2} (UL_{95,m} + LL_{95,m})}{\hat{P}_k} \times 100 ,$$

where $UL_{95,m}$ and $LL_{95,m}$ are upper and lower 95 percent confidence bounds, respectively, and \hat{P}_k is the performance prediction (given in Sec. 3).

The L_{95} map given in Fig. 92 is a composite representation applicable to the 15 different crewmember positions and, hence, is approximate. The L_{95} ranges are given for the regions bounded within the curved lines.

The scale of Fig. 74 matches those of Figs. 59 through 73; accordingly, approximate L_{95} values can be related to the performance contours. Although the regression prediction L_{95} values do vary somewhat among the different crewmembers (see Table 28), the variations are not large enough to merit individual attention. Some exceptions, however, can be specifically pointed out. For symptom complex 113111, the performance data estimates exceeded the upper 95 percent conditional mean confidence bounds of the regression prediction, being higher than the mean value predicted by the regression relationship as follows (see Table 28): gun crew, chief of section--14 percent; gun crew, loader--21 percent; FDC crew, fire direction officer--14 percent; FDC crew, horizontal control operator--29 percent; and TOW crew, loader--14 percent.

The rectangular enclosures bordered by the dotted lines in Fig. 92 correspond to the regions where symptom complex 113111 is stipulated (see Fig. 44). The FDC crew horizontal control operator and gun crew loader crewmembers represent the most extreme cases and may merit special consideration when making performance estimates, depending on

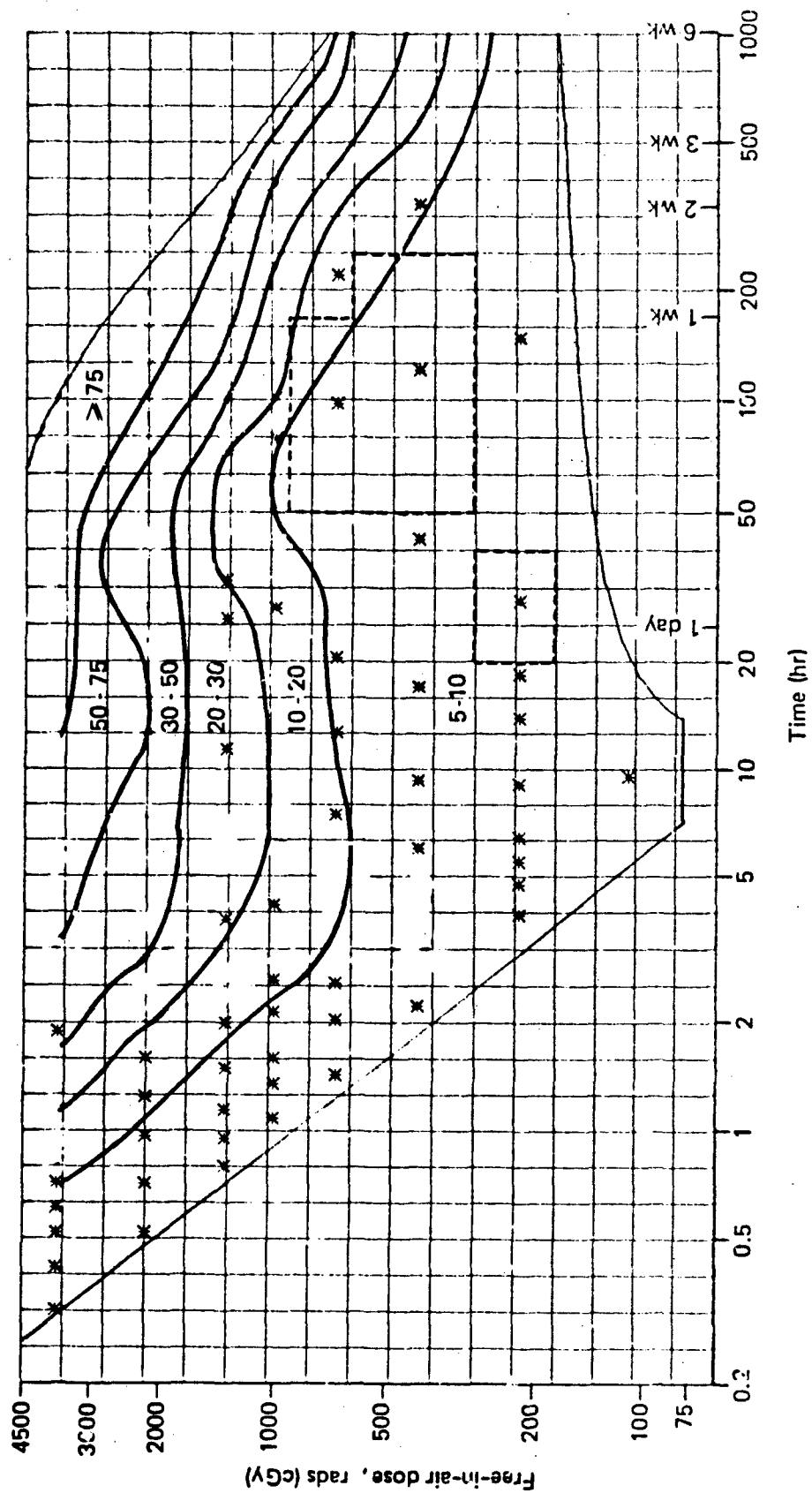


Figure 92. Individual performance prediction confidence bounds.

whether or not conservative estimates are desired. It should be noted here that the performance data for symptom complex 113111, although exceeding the conditional mean bounds, do not lie outside the 95 percent confidence bounds for a *further data* observation based on the variance $\hat{\sigma}_0^2$, discussed in Sec. 3.

The L_{95} contours represented in Fig. 92 are only applicable to the performance values at a particular dose and time. We have not attempted to relate them to lateral variations in dose and/or time although, in principle, estimates of that type can be made. The L_{95} contour pattern shows the correlation with input data points associated with symptom complexes used in the questionnaires (given by the asterisks). In general, L_{95} values increase in regions devoid of the asterisks, where regression predictions were made for symptom complexes not included in the questionnaires. Large increases are situated in regions of high dose and/or long times, where caution should be exercised. Consider the upper-right-hand region where the L_{95} value is indicated as ≥ 75 percent. If a performance value of 10 percent were estimated from one of the contour plots, and an error of 100 percent chosen from Fig. 92, the estimated upper and lower 95 percent limits based on the regression analysis would be 0 to 20 percent. Depending upon the dose, 20 percent may be unreasonably excessive or 0 percent may be too severe; that is a judgment that must be made by each individual user of the information presented here.

SUMMARY AND CONCLUSIONS

In this report, the performance levels of individual combat crewmembers have been estimated following prompt ionizing radiation exposure. The estimates have been developed to serve as the basis for planning military field operations and training for combat in a nuclear weapon radiation environment. We have expressed performance as a function of two critical variables, dose (free-in-air) and time.

Performance levels have been expressed both graphically and in tabular form. The overall picture is given by the three-dimensional plots prepared for each of the 15 different crewmembers selected to represent typical short-term (from 30 to 200 sec) battlefield engagement

scenarios for small combat crews--3 to 4 members. Isoperformance plots and the numerical data given in Appendix J provide working data for selecting or developing further numerical estimates of performance.

Unfortunately, we cannot in any succinct manner assign numerical degrees of uncertainty to the dose/time performance estimates provided (other than the conditional confidence bounds discussed above). That problem is caused by a lack of quantitative data associated with the source of information we combined to formulate the estimates of performance. The performance results we developed rely on two basic bodies of information. The first comes from the comprehensive symptomatology review of human irradiation experience [Baum et al., 1983], and the second comes from the army questionnaires. Based on those two sources some guidance can be provided for utilizing the performance estimates presented.

From the review of acute radiation sickness and symptomatology, we are confident that the dose/time framework (Sec. 4) of symptom complexes describes the typical acute sequelae for humans even though considerable variation in response has been observed in symptom severity and time of expression.

The symptom complexes used to construct the dose/time framework represent well over 50 percent of those exposed to doses of from 300 rads (cGy) and above, from 30 to 60 percent of those exposed to doses of 150 to 300 rads (cGy), and from 5 to 10 percent of those exposed to doses of from 75 to 150 rads (cGy) [Baum et al., 1983]. Therefore, since the performance response data obtained from the army questionnaires were based on the symptom descriptions appearing in the dose/time framework, our performance estimates as a function of dose and time correspond to those percentages.

The performance data correlated with dose and time were derived from army personnel who were asked to judge how they might be able to perform if they had acute radiation symptoms described to them. Accordingly, we have no clear direct way to quantify in a comprehensive manner just how reliable their judgments might be, although the respondents selected for the questionnaires were combat crewmembers trained in

performing the tasks and operating the equipment we focused upon. We can point out, however, that after making some improvements in the response data, our analysis indicates reasonable consistency in the performance trends with symptom severity (and dose level) and the type of crewman (i.e., type of tasks performed). In view of the fact that we cannot prescribe a sound quantitative measure of uncertainty, other than the conditional variation in the response data, we encourage a measure of understanding with regard to purpose in its application.

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Appendix A

RESPONSES TO QUESTIONNAIRES

This appendix contains all of the responses from each questionnaire administered to acceptable respondents (116 total). The data are entered in the form of time in seconds. Table 1 in Sec. 2 itemizes the disposition of all the questionnaires (161 total). The responses to the 24 questionnaires were not recorded from the excluded respondents because they did not lie within the population we wished to poll. Appendix D contains the responses to the 21 questionnaires from respondents who were rejected because their answers were unresponsive.

OF INDOGRAPHIC DATA

GRADE : IF-5
 MOS : 13020
 IN ARMY : 0YK
 IN APILLER : 0YK
 CUNDAI : 3N
 ARTIL. COMBAT : 10

WHEN : MID YK
 HOW LONG : YK MO

UN. OF SECTION :
 UN. OF PLP :
 AS. GUNNER :
 LOADER :

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO MPPLY
 9=NO REPLY (FOR CONFIDENCE)

155 J.P. GUN CREW

#SUPERVISED : 10

CREW TASKS

ROUTINARY TASKS

CHW STMP LOW LIND LIFT CLIMB WALK LIFT UPEN
 CUMP STAIRS ROYS STAIRS BOYS LOCK
 WSP

USUAL TIME: 15 20 UNSTIPULATED

3

1.5

2

5

2

3

7

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1

CHIEF OF SECTION + SPECIAL WEAPONS TEAM CHIEF, SUPERVISING A 10 MAN GUN CREW + A 4 MAN SPECIAL WPNS. TEAM.

0=NO INFO; 1=SE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO MEPLY
3=NO MEPLY (FOR CONFIDENCE)

02 : 0351AKJdlc

CREW TASKS

ORDINARY TASKS

[illegible]

I'VE USED A LOT ALL OF MY ARMY CAREER. I'M ALSO IN SPECIAL WEAPONS AND HAVE BEEN FOR THE PAST 3 YEARS.

155 S. P. SUNG

DEFENSE ATTL DATA				WHEN		HOW LONG	
GRADE		MO	YR	MO	YR	MO	YR
1ST LT	1952	10	92			2	
2ND LT	1952			91		10	
3RD LT	1952			91		10	
4TH LT	1952			91		10	
5TH LT	1952			91		10	
6TH LT	1952			91		10	
7TH LT	1952			91		10	
8TH LT	1952			91		10	
9TH LT	1952			91		10	
10TH LT	1952			91		10	
11TH LT	1952			91		10	
12TH LT	1952			91		10	
13TH LT	1952			91		10	
14TH LT	1952			91		10	
15TH LT	1952			91		10	
16TH LT	1952			91		10	
17TH LT	1952			91		10	
18TH LT	1952			91		10	
19TH LT	1952			91		10	
20TH LT	1952			91		10	
21TH LT	1952			91		10	
22TH LT	1952			91		10	
23TH LT	1952			91		10	
24TH LT	1952			91		10	
25TH LT	1952			91		10	
26TH LT	1952			91		10	
27TH LT	1952			91		10	
28TH LT	1952			91		10	
29TH LT	1952			91		10	
30TH LT	1952			91		10	
31TH LT	1952			91		10	
32TH LT	1952			91		10	
33TH LT	1952			91		10	
34TH LT	1952			91		10	
35TH LT	1952			91		10	
36TH LT	1952			91		10	
37TH LT	1952			91		10	
38TH LT	1952			91		10	
39TH LT	1952			91		10	
40TH LT	1952			91		10	
41TH LT	1952			91		10	
42TH LT	1952			91		10	
43TH LT	1952			91		10	
44TH LT	1952			91		10	
45TH LT	1952			91		10	
46TH LT	1952			91		10	
47TH LT	1952			91		10	
48TH LT	1952			91		10	
49TH LT	1952			91		10	
50TH LT	1952			91		10	
51TH LT	1952			91		10	
52TH LT	1952			91		10	
53TH LT	1952			91		10	
54TH LT	1952			91		10	
55TH LT	1952			91		10	
56TH LT	1952			91		10	
57TH LT	1952			91		10	
58TH LT	1952			91		10	
59TH LT	1952			91		10	
60TH LT	1952			91		10	
61TH LT	1952			91		10	
62TH LT	1952			91		10	
63TH LT	1952			91		10	
64TH LT							

COMMUNAL : 11
 ANTIU. COPIES : 11
 MSUPFKVISED : 5

LIFEW TASKS

ADDITIONAL TASKS

[illegible]

DISCLAIMER

[illegible]

GRADE : 25
 MUS : 15020
 IN ARMY : 75
 IN ARTILLERY : 74
 CH. OF SECTION : 10
 CH. OF SECTION : 10
 AS. GUNNER : 75
 AS. GUNNER : 74
 LOADER : 74
 LOADER : 74

COMBAT : 5
 ARTIL. COMBAT : 5
 SUPERVISED : 5

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

CREW TASKS

ORDINARY TASKS

CREW	SYMP	COMP	CLIMB	STAIRS	MOVES	WALK	LIFT	UPEN	CH. SECT	GUNNER	AST. GUNNER	LIFT	PRJCL	POS	PLACE	INS	FIRE	SMASH	INSPECT
USUAL TIME, SEC	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
1 2 411111	25	45	25	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1 2 515431	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 114111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 515411	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 213111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 413111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 311111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 313111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 515221	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 414111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 535111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 112111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 514111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 513111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 334231	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 113111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 521111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 214111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 415111	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 211131	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 2 112121	30	50	30	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

SUPERVISOR AND TRAIN THE PERSONNEL IN MY SECTION AND NATIVELY, PERFORM DUTIES AS A SECTION CHIEF.

02ND INCREASE ABOVE USUAL TIME
 -13CANNOT DO IT AT ALL
 99902ND REPLY (FOR CONFIDENCE)
 92ND REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE IF-A LM OF SECTIONS: 75 0
 MUS 110500 CHIEF 3
 IN ARMY 110500 AS-GUNNER 3
 IN ARTILLERY 110500 CHIEF 3
 WHEN
 COMPANY 3
 ARTILLERY COMPANY 3
 SUPERVISED: 10

CREW TASKS

USUAL TASKS

CREW	STMP	CUM	CLIMB	LIFT	CLIMB	WALK	PIPE	UPEN	LOCK	UNUSUAL	LM SECT	GUNNER				AST. GUNNER				LOADER						
												SET	THAV	DEF	LEVEL	SET	FLEV	UNAD	LEVEL	LIFT	PRJCL	OP	CHARGE	INS	FIRE	CHAB
RESP	USUAL	TIME	SEC	15	20	UNUSUAL																1.5	1.5	3		
1	4	411111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515031	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	114111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515311	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	213111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	415111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	311111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515211	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	414112	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	112111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	514111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515113	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	515111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	123111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	342531	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	113111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	521111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	211111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	224111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	415111	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	214131	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10
1	4	112121	0	20	60	3	10	3	10	3	10	10	20	10	15	10	15	10	15	0	10	10	5	4	3	10

0=NO INCREASE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

155 5.4. 500 500

COVVAL : 11
ARTIL. CORR+T: 21
SUPERVISED : 20

UPPER TASKS

ADDITIONAL TASKS

TIME	STOP	CH. 1	CH. 2	CH. 3	CH. 4	CH. 5	CH. 6	CH. 7	CH. 8	CH. 9	CH. 10	CH. 11	CH. 12	CH. 13	CH. 14	CH. 15	CH. 16	CH. 17	CH. 18	CH. 19	CH. 20	CH. 21	CH. 22	CH. 23	CH. 24	CH. 25	CH. 26	CH. 27	CH. 28	CH. 29	CH. 30	CH. 31	CH. 32	CH. 33	CH. 34	CH. 35	CH. 36	CH. 37	CH. 38	CH. 39	CH. 40	CH. 41	CH. 42	CH. 43	CH. 44	CH. 45	CH. 46	CH. 47	CH. 48	CH. 49	CH. 50	CH. 51	CH. 52	CH. 53	CH. 54	CH. 55	CH. 56	CH. 57	CH. 58	CH. 59	CH. 60	CH. 61	CH. 62	CH. 63	CH. 64	CH. 65	CH. 66	CH. 67	CH. 68	CH. 69	CH. 70	CH. 71	CH. 72	CH. 73	CH. 74	CH. 75	CH. 76	CH. 77	CH. 78	CH. 79	CH. 80	CH. 81	CH. 82	CH. 83	CH. 84	CH. 85	CH. 86	CH. 87	CH. 88	CH. 89	CH. 90	CH. 91	CH. 92	CH. 93	CH. 94	CH. 95	CH. 96	CH. 97	CH. 98	CH. 99	CH. 100	CH. 101	CH. 102	CH. 103	CH. 104	CH. 105	CH. 106	CH. 107	CH. 108	CH. 109	CH. 110	CH. 111	CH. 112	CH. 113	CH. 114	CH. 115	CH. 116	CH. 117	CH. 118	CH. 119	CH. 120	CH. 121	CH. 122	CH. 123	CH. 124	CH. 125	CH. 126	CH. 127	CH. 128	CH. 129	CH. 130	CH. 131	CH. 132	CH. 133	CH. 134	CH. 135	CH. 136	CH. 137	CH. 138	CH. 139	CH. 140	CH. 141	CH. 142	CH. 143	CH. 144	CH. 145	CH. 146	CH. 147	CH. 148	CH. 149	CH. 150	CH. 151	CH. 152	CH. 153	CH. 154	CH. 155	CH. 156	CH. 157	CH. 158	CH. 159	CH. 160	CH. 161	CH. 162	CH. 163	CH. 164	CH. 165	CH. 166	CH. 167	CH. 168	CH. 169	CH. 170	CH. 171	CH. 172	CH. 173	CH. 174	CH. 175	CH. 176	CH. 177	CH. 178	CH. 179	CH. 180	CH. 181	CH. 182	CH. 183	CH. 184	CH. 185	CH. 186	CH. 187	CH. 188	CH. 189	CH. 190	CH. 191	CH. 192	CH. 193	CH. 194	CH. 195	CH. 196	CH. 197	CH. 198	CH. 199	CH. 200	CH. 201	CH. 202	CH. 203	CH. 204	CH. 205	CH. 206	CH. 207	CH. 208	CH. 209	CH. 210	CH. 211	CH. 212	CH. 213	CH. 214	CH. 215	CH. 216	CH. 217	CH. 218	CH. 219	CH. 220	CH. 221	CH. 222	CH. 223	CH. 224	CH. 225	CH. 226	CH. 227	CH. 228	CH. 229	CH. 230	CH. 231	CH. 232	CH. 233	CH. 234	CH. 235	CH. 236	CH. 237	CH. 238	CH. 239	CH. 240	CH. 241	CH. 242	CH. 243	CH. 244	CH. 245	CH. 246	CH. 247	CH. 248	CH. 249	CH. 250	CH. 251	CH. 252	CH. 253	CH. 254	CH. 255	CH. 256	CH. 257	CH. 258	CH. 259	CH. 260	CH. 261	CH. 262	CH. 263	CH. 264	CH. 265	CH. 266	CH. 267	CH. 268	CH. 269	CH. 270	CH. 271	CH. 272	CH. 273	CH. 274	CH. 275	CH. 276	CH. 277	CH. 278
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I HAVE NO SUGGESTION OF MY PEOPLE TO THE COMMUNITY, WHICH IS 7 PEOPLE, IN CLEANING UP THEIR ROOM AND GETTING READY FOR THE JOB. I HAVE WITHIN MYSELF, I THINK, THAT I HAVE TO MAKE SURE THE PROPER PREVENTIVE MAINTENANCE + CHECKS AND SERVICES ARE DONE. I HAVE TO BE ACCOUNTABLE FOR MY TOOLS AND SERVICEABILITY

155 S.P. GUN CFW

	DISTRIBUTION DATA						
GRADE :	F-5	CN OF ACTION:	AZ	MMER	HUN LUNG		
MUS :	1927	GUMMER :	A1	HO VM	YR HN		
IN ARMY :	SVK	AS-COMMTH :	79	Z	R		
IN AIRPLANE :	SVK	LOADER :	7A	I	A		

91 : UTSIARJ.1115

CREW TASKS

UPTON, ILL. 1945

CGRN	SWMP	CON	CLIMB	LIFT	CLIMB	WALK	LIFT	UPEN	CALL	UNSEFI	RUNNER		ART. CLIMBER		LOADER		SWAB	INSPECT	
											SET	TRAY	SET	FLEV	POS	PLATE			INS
WSP	TIME	SEC	15	20	25	30	35	40	45	50	DEF	LEVEL	QUAD	LEVEL	OP	CHARGE	PHIN		
1	7	411111	0	50	0	30	10	10	7	5	0	0	10	0	0	2	1.5	1.5	3
1	7	515031	0	50	10	50	10	120	180	7	0	190	180	195	0	0	3	0	4
1	7	111111	0	120	120	5	120	48	30	120	190	30	20	20	15	15	-1	-1	-1
1	7	515111	0	120	65	5	45	45	60	60	60	60	30	60	40	-1	-1	-1	-1
1	7	213111	0	120	10	2	30	30	10	15	10	10	10	12	10	0	0	6	12
1	7	413111	0	125	10	2	30	25	15	15	10	10	15	15	10	10	10	10	10
1	7	311111	0	60	5	2	2	25	0	0	0	0	0	0	5	5	3	3	5
1	7	515221	0	50	5	2	2	25	0	0	10	10	0	10	5	5	3	3	5
1	7	410112	0	50	5	2	2	25	0	0	10	10	0	10	5	5	3	3	5
1	7	535111	0	50	5	2	2	25	0	0	10	10	0	10	5	5	3	3	5
1	7	111111	0	65	5	10	5	30	10	10	10	10	10	10	7	5	3	3	5
1	7	514111	0	50	5	10	5	30	10	10	10	10	10	10	7	5	3	3	5
1	7	313112	0	50	5	10	5	30	10	10	10	10	10	10	7	5	3	3	5
1	7	513111	0	120	5	5	2	25	0	0	10	10	0	10	5	5	3	3	5
1	7	123111	0	195	5	5	4	20	20	20	25	25	25	25	10	10	10	10	15
1	7	330251	0	195	5	5	4	20	20	20	25	25	25	25	10	10	10	10	15
1	7	113111	0	190	5	5	4	20	20	20	25	25	25	25	10	10	10	10	15
1	7	521111	0	40	5	5	0	45	10	10	10	10	10	10	10	10	10	10	15
1	7	211111	0	120	5	5	0	45	10	10	10	10	10	10	10	10	10	10	15
1	7	413111	0	120	5	5	0	45	10	10	10	10	10	10	10	10	10	10	15
1	7	413111	0	120	5	5	0	45	10	10	10	10	10	10	10	10	10	10	15
1	7	413111	0	120	5	5	0	45	10	10	10	10	10	10	10	10	10	10	15
1	7	413111	0	120	5	5	0	45	10	10									

AS CHIEF OF SECTION MY DUTIES WAS BLIN TO TRAIN MY WIFE TO DO THEIR ASSIGN TASK SO THAT THE UNIT MAY DO ITS MISSION UNLESS TO TRADITION IN THE BEST MEANS POSSIBLE IN THEIR ASSIGN MUS.

02NU INCREASE ABOVE USUAL TIME
-12CANNOT DO IT AT ALL
99902NO REPLY
92NU REPLY (FOR CONFIDENCE)

195 S.P. FUN CFM

ACTII. COMBAT: Y 70 / 2 #SUPERVISOR: J 1

CREW TASKS

URUTJAKY TACKS

[illegible]

Y ALL A CHIEF OF SECTION OF 155 SP. HIGWAY AND THAT IS WHAT I HAVE GUNY AND SUGER TRAINA SONIER, # C 3/18FA

155 S. 4th St.

DISPOSITIONAL DATA		DATE		TIME	
		MO	YR	MO	YR
55	CH. OF SECTION:	2	4		
3020	NUMBER:	1			
4000	AS. NUMBER:	1			
4000	LOADER:				

CUMULATIVE : 21
 ARIAL : COMPUTED : 10
 SUPERVISOR : 10

CREW TASKS

URGENT TASKS

CH. SECT:		RUNNER		AST. GUNNER		LOADER					
CH. SECT:		SET	TRAV	SET	FLV	LIFT	POS	PLACE	INS	FINE	SWAB
CH. SECT:		DEF	LEVEL	WHIP	LEVEL	PRJCTL	OP	CHARGE	PRIM		INSPECT
CHRM	STAMP	LOW CLIMB	LFT CLIMB	WALK	LIFT	UPEN	CALL				
	CUMP	STAIRS	BOXES STAIRS		WORKS	LOCK	QUAD				
REFSP							FLV				

[illegible][illegible]

7 HAVE OFTEN A MILITARY ASSIGNMENT AND HEADEN IN THE SPECIAL WEAPONS SECTION (ARMS) ALSO I BEEN AIRY AND ALSO
ENLISTED IN THE ARMY.

0=NO INCREASE ABOVE USUAL TIME
1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

1555 5.1' - 6.00 CHF

COMBAT : 11
ARTILL. COMPAN : 10
SUPERVISED : 10

Ref : U757AMJ-11151

CREATING TASKS

ADDITIONAL TASKS

REFNO	STAMP	LNO	CLIMB	STAIRS	MOVES	LIFT	CLIMB	WALK	LIFT	UPRM	LOCK	CALL	CH. SECT	RUNNER		AST. GUNNER		LOADER					FIRE	SHAD	INSPECT
														SET	TRAV	SET	ELEV	PRJCL	POS	PLACE	INS	PRIM			
REFNO	STAMP	LNO	CLIMB	STAIRS	MOVES	BOXES	STAIRS	WALK	BOXES	LOCK	LOCK	ELFV	CH. SECT	SET	TRAV	SET	ELEV	PRJCL	POS	PLACE	INS	PRIM	FIRE	SHAD	INSPECT
			15	20				MULTIPLICATED						3	7	7	7	3	2	5	2	1.5	1.5	3	
1	18	41111	0	-1	2	3	2	3	5	-1	-1	12		0	2	0	10	-1	9	6	5	0	12		
1	18	515431	0	-1	1	1	1	1	1	-1	-1	15		0	20	0	17	-1	12	13	7	0	10		
1	18	114111	0	05	0	3	0	5	3	40	0	0		0	10	0	5	0	0	4	0	0	3		
1	18	515311	0	00	1	2	1	3	2	60	0	0		0	12	0	6	-1	8	5	3	4	0		
1	18	213111	0	30	2	3	2	8	3	30	0	7		0	0	0	8	17	9	6	3	2	7		
1	18	413111	0	30	2	3	2	8	3	30	0	0		0	20	0	12	18	8	5	4	4	9		
1	18	313111	0	120	5	10	5	10	5	30	0	0		0	0	0	0	0	0	5	5	0	6		
1	18	515223	0	35	3	4	3	6	4	30	0	0		0	10	0	5	10	0	5	3	2	3		
1	18	414112	0	00	1	2	1	2	1	50	0	0		0	0	0	0	-1	8	-1	5	5	10		
1	18	515111	0	00	1	2	1	2	2	50	0	10		0	15	0	10	-1	10	-1	5	5	10		
1	18	112111	0	30	4	4	4	6	4	60	0	0		0	0	0	0	6	0	4	0	5	10		
1	18	514111	0	35	3	3	3	3	2	25	0	0		0	10	0	0	-1	0	-1	0	0	3		
1	18	313112	0	00	1	3	1	6	3	32	0	0		0	9	0	5	10	0	6	4	5	12		
1	18	515113	0	-1	1	1	1	3	1	60	0	0		0	12	0	5	-1	0	-1	5	4	12		
1	18	413111	0	-1	1	3	1	3	1	50	0	5		0	9	0	0	-1	0	-1	5	5	15		
1	18	123111	0	25	4	4	4	3	-1	20	0	0		0	0	0	0	-1	0	-1	5	5	15		
1	18	313231	0	35	2	3	3	3	-1	30	0	0		0	10	0	0	-1	0	-1	5	5	15		
1	18	113111	0	25	7	10	6	10	6	30	0	0		0	0	0	0	10	0	5	5	5	17		
1	18	515111	0	-1	1	3	3	3	-1	35	0	0		0	13	0	12	-1	12	-1	5	5	17		
1	18	113121	0	30	5	3	3	8	3	30	0	0		0	0	0	6	8	0	4	3	3	6		
1	18	211111	0	-1	4	4	4	6	3	30	0	0		0	0	0	6	0	0	4	0	0	3		
1	18	515111	0	-1	4	4	4	6	-1	30	0	0		0	0	0	6	0	0	0	0	0	3		
1	18	254111	0	00	1	2	1	8	-1	40	0	5		0	10	0	7	-1	6	-1	4	4	9		
1	18	415311	0	50	1	2	2	2	2	40	0	10		0	15	0	7	-1	10	-1	5	5	11		
1	18	312111	0	35	50	3	3	7	3	30	0	5		0	10	0	8	12	8	5	5	5	11		
1	18	314112	0	00	-1	1	1	3	-1	40	0	0		0	13	0	10	-1	8	-1	5	5	14		
1	18	314113	0	-1	1	1	1	3	-1	40	0	0		0	0	0	0	-1	8	-1	6	0	3		
1	18	412111	0	10	30	2	4	0	2	30	0	0		0	0	0	0	5	0	4	3	0	4		
1	18	414111	0	20	50	4	5	0	4	20	0	0		0	0	0	0	12	0	4	5	5	11		
1	18	515111	0	00	-1	3	2	0	3	35	0	5		0	10	0	0	-1	8	-1	5	5	11		

MY UNITS WERE NOT IN GERMANY AND SECURITY STAFF HAD ALONG W/GERMAN SOLDIERS CUSTODIAL GUARDS FOR 155 MIKE HQ. TRANSFER HERE TO FT. STELLERMANL CHIEF FILING COPY FOR 2/12/68. * VIETNAM

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

PERSONNEL DATA
 GRADE SF-7 CH. OF SECTION: 71
 MGR 3139 GUNNER : 68 1
 IN ARMY 314YK 11ND AS-GUNNER : 68 1
 IN ARTILLERY 314YK 11 LOADER : 68 1
 WHEN
 COMBAT 31 60 004
 ARTIL. COMBAT 31 60 004
 SUPERVISED : 10

CREW TASKS

OPERATIVE TASKS

CREW RESP	USUAL TIME, SEC	LIFT CLIMB	STAIRS	MOVES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	CH. SECT	GUNNER	SET DEF	TRAV DEF	AST. GUNNER	SET ELEV	ELEV LEVEL	LIFT PRJCTL	POS OP	PLACE CHARGE	INS PRIM	TYPE INSPECT	SCAB
1 19 411111	20	-1	2	-1	-1	5	-1	-1	7	10	-1	10	10	-1	5	8	5	6	1.5	3	4
1 19 515031	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 19 114111	17	40	3	15	15	20	3	15	5	0	0	0	0	0	0	0	0	0	0	0	0
1 19 515311	5	-1	-1	-1	-1	-1	-1	-1	12	9	0	0	0	0	0	0	0	0	0	0	0
1 19 213111	20	25	2	20	3	20	3	40	5	0	0	0	0	0	0	0	0	0	0	0	0
1 19 413111	30	50	2	50	1	60	7	30	8	0	0	0	0	0	0	0	0	0	0	0	0
1 19 313111	0	0	4	0	4	60	4	30	4	0	0	0	0	0	0	0	0	0	0	0	0
1 19 515231	5	-1	-1	-1	-1	-1	-1	-1	20	12	0	0	0	0	0	0	0	0	0	0	0
1 19 414112	20	30	2	10	2	10	2	40	8	0	0	0	0	0	0	0	0	0	0	0	0
1 19 515111	0	-1	1	5	2	5	2	40	10	0	0	0	0	0	0	0	0	0	0	0	0
1 19 112111	5	0	3	30	8	30	3	40	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 514111	0	25	3	10	3	10	3	40	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 313112	20	30	3	30	3	10	3	40	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 515112	0	20	2	5	5	5	3	40	10	0	0	0	0	0	0	0	0	0	0	0	0
1 19 515113	0	20	2	5	5	5	3	40	10	0	0	0	0	0	0	0	0	0	0	0	0
1 19 123111	0	0	3	3	15	15	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0
1 19 514231	0	45	-1	2	2	30	-1	20	10	0	0	0	0	0	0	0	0	0	0	0	0
1 19 113111	5	0	3	30	10	30	10	20	0	0	0	0	0	0	0	0	0	0	0	0	0
1 19 521111	0	20	45	2	5	5	5	40	6	15	15	15	15	10	0	0	0	0	0	0	0
1 19 113112	0	0	3	3	15	15	5	30	5	0	0	0	0	0	0	0	0	0	0	0	0
1 19 211111	0	0	3	3	10	10	5	30	4	0	0	0	0	0	0	0	0	0	0	0	0
1 19 224111	0	20	30	3	30	30	3	30	4	0	0	0	0	0	0	0	0	0	0	0	0
1 19 415114	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 19 312111	0	25	3	11	5	11	5	30	5	0	0	0	0	0	0	0	0	0	0	0	0
1 19 514112	0	25	2	5	5	5	5	35	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 314112	0	25	2	5	5	5	5	35	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 514113	0	25	2	5	5	5	5	35	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 412111	0	0	2	15	6	15	6	35	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 414111	0	30	2	5	5	5	5	40	6	0	0	0	0	0	0	0	0	0	0	0	0
1 19 525111	0	25	3	5	5	5	5	40	7	0	0	0	0	0	0	0	0	0	0	0	0

SUPERVISOR THE MAINTENANCE AND ACCOUNTABILITY OF SEC. EQUIP AND TRAINING OF PERSONNEL BOTH INDIVIDUAL AND COLLECTIVE TRAINING.
 SUPPORT AND EQUIPMENT CAREER DEVELOPMENT OF SUBORDINATE SOLDIERS.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA
 GRADE : E-4
 MOS : 13530
 IN ARMY : 9YR
 IN ARTILLERY : 6YR
 WHEN : 79
 HOW LONG : 4
 WHEN : 78
 HOW LONG : 1
 WHEN : 75
 HOW LONG : 1

CURRENT : 31
 ARTILL. LOCATION : 50
 SUPERVISED : 50

CREW TASKS

ORDINARY TASKS

CREW RESP	STAMP	COM. CLIMB STAIRS	MOVES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	CH. SECT	GUNNER			AST. GUNNER			LOADER					
									SET DEF	TRAV LEVEL	FLV	SET WIND	FLV ELEV	LEVEL	PRJCT	LIFT	POS OP	PLACE CHARGE	INS PRIM	FIRE
USUAL TIME	15	20	UNDETERMINED					3	7	7	7	3	3	2	5	2	1.5	1.5	3	
1 20 411111	3	60	40	-1	7	0.5	10	4	10	10	10	11	10	10	0	10	0	0	0	0
1 20 512731	3	170	40	-1	3	3	20	15	10	10	10	30	10	10	15	-1	5	5	5	25
1 20 114111	3	170	40	-1	1	15	15	4	10	10	10	10	10	10	0	10	0	0	0	4
1 20 515311	3	60	30	3	30	3	10	0	10	10	10	8	10	10	10	5	5	5	6	6
1 20 213111	3	20	30	-1	2	30	30	0	10	10	10	0	10	15	6	5	0	0	0	6
1 20 413111	3	20	30	-1	2	30	30	0	10	10	10	0	10	15	6	5	2	2	2	6
1 20 313111	3	0	23	-1	4	60	60	0	10	10	10	4	10	15	0	5	0	0	0	0
1 20 513111	3	20	30	-1	2	30	30	0	10	10	10	4	10	10	6	5	0	0	0	0
1 20 512231	3	60	40	-1	1	3	30	4	10	12	10	7	10	10	10	15	5	5	5	7
1 20 414112	3	20	30	-1	3	30	30	4	10	15	10	8	10	10	7	10	5	5	5	7
1 20 515111	3	20	30	-1	3	30	30	0	10	15	10	8	10	10	10	10	5	5	5	7
1 20 112111	3	20	30	-1	2	30	30	0	10	20	10	15	20	10	10	10	5	5	5	7
1 20 514111	3	120	60	1	1	10	10	15	10	15	10	15	15	10	10	10	5	5	5	7
1 20 313112	3	20	40	-1	1	0.5	10	5	10	15	10	15	15	10	10	10	5	5	5	7
1 20 515112	3	-1	-1	-1	-1	-1	10	10	10	15	10	15	15	10	10	10	5	5	5	7
1 20 515111	3	20	25	-1	1	1	10	0	10	15	10	15	15	10	10	10	5	5	5	7
1 20 123111	3	-1	-1	-1	-1	-1	10	0	10	15	10	15	15	10	10	10	5	5	5	7
1 20 314231	3	-1	-1	-1	-1	-1	10	0	10	15	10	15	15	10	10	10	5	5	5	7
1 20 113111	3	20	25	-1	2	15	15	0	10	15	10	15	15	10	10	10	5	5	5	7
1 20 521111	3	20	25	-1	2	15	15	0	10	15	10	15	15	10	10	10	5	5	5	7
1 20 113121	3	30	35	-1	1	1.5	10	4	10	10	10	6	10	10	10	10	5	5	5	7
1 20 211111	3	30	30	-1	1	1	10	0	10	10	10	5	10	10	10	10	5	5	5	7
1 20 224111	3	30	30	-1	1	1	10	0	10	10	10	5	10	10	10	10	5	5	5	7
1 20 415310	3	-1	-1	-1	-1	-1	10	10	10	10	10	5	10	10	10	10	5	5	5	7
1 20 312111	3	20	25	-1	2	10	10	0	10	10	10	5	10	10	10	10	5	5	5	7
1 20 314112	3	20	25	-1	2	10	10	0	10	10	10	5	10	10	10	10	5	5	5	7
1 20 314113	3	20	25	-1	2	10	10	0	10	10	10	5	10	10	10	10	5	5	5	7
1 20 412111	3	25	35	-1	1	1	10	4	10	10	10	6	10	10	10	10	5	5	5	7
1 20 414111	3	-1	-1	-1	-1	-1	10	12	10	12	10	6	10	10	10	10	5	5	5	7
1 20 525111	3	-1	-1	-1	-1	-1	10	12	10	12	10	6	10	10	10	10	5	5	5	7

I WAS AN ASSEMBLER ON THE 155 SYSTEM IN NORTHEN GOLF. I WAS AT THE 155 USAFAD. I PCS'ED TO FT. SILL WHERE I AM NOW A GUNNER ON A SECTION.

GRADE : 1F-5
 POS : 113020
 IN ARMY : SYM AND
 IN ARTILLERY : SYM A
 COMBAT : IN
 ARTIL. COMBAT :
 WHEN : NOV 1960
 NO YR : 1
 YR MO : 1
 CH.OF SECTION : A1
 GUNNER : A2
 AS. GUNNER :
 LOADER :
 ASHTRAYED : 50

0200 INCREASE ABOVE USUAL TIME
 -11=CANNOT DO IT AT ALL
 9990=NO REPLY
 9990 REPLY (FOR CONFIDENCE)

155 S.F. RUN CREW

CREW TASKS

ORDINARY TASKS

CREW RESP	SYNCH COMP	LOW CLIMB	STAIRS	LIFT MOVS	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	CH. SECT	GUNNER	SET TRAV DEF	THAV LVL	SET WIND ELEV	ELFV	AST. GUNNER	SET WIND ELEV	LIFT PROJIL	POS CHARGE	PLAC OP	CHARGE	LOADER	FINE INS	SHAB	INSPECT
1 22 411111	3	30	80	2	2	1	1	1	10	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0
1 22 515311	3	-1	-1	1	1	1	1	1	-1	0	0	14	11	11	7	5	5	0	0	0	0	0	0	0
1 22 114111	3	-1	-1	1	1	1	1	1	5	10	12	12	10	10	12	5	4	0	0	0	0	0	0	0
1 22 515311	3	-1	-1	1	1	1	1	1	10	12	15	15	10	10	7	4	4	0	0	0	0	0	0	0
1 22 213111	3	30	60	1	1	1	1	1	5	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0
1 22 413111	3	65	90	1	1	1	1	1	6	9	9	11	9	9	5	4	4	0	0	0	0	0	0	0
1 22 311111	3	25	40	3	3	2	2	2	6	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0
1 22 313111	3	30	35	2	2	1	1	1	7	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0
1 22 515231	3	30	-1	1	1	1	1	1	0	9	9	8	8	8	5	4	4	0	0	0	0	0	0	0
1 22 414112	3	120	65	1	1	1	1	1	-1	14	16	16	12	12	6	5	5	0	0	0	0	0	0	0
1 22 515111	3	60	30	2	2	1	1	1	-1	14	16	16	12	12	6	5	5	0	0	0	0	0	0	0
1 22 112111	3	25	35	4	4	3	3	3	10	15	13	13	13	13	6	4	4	0	0	0	0	0	0	0
1 22 514111	3	60	120	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 313112	3	45	150	1	1	1	1	1	6	9	10	12	9	9	5	3	3	0	0	0	0	0	0	0
1 22 515111	3	30	60	2	2	1	1	1	5	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0
1 22 313111	3	30	150	1	1	1	1	1	-1	10	12	12	9	9	5	3	3	0	0	0	0	0	0	0
1 22 515111	3	30	60	2	2	1	1	1	5	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0
1 22 123111	3	30	60	3	3	2	2	2	-1	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0
1 22 313231	3	30	60	2	2	1	1	1	-1	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0
1 22 113111	3	0	0	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 514121	3	0	0	3	3	2	2	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 211111	3	20	30	3	3	2	2	2	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 224111	3	20	40	2	2	1	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 415311	3	60	120	1	1	1	1	1	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 312111	3	20	35	2	2	1	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 314112	3	20	40	2	2	1	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 314113	3	25	30	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 412111	3	20	35	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 414111	3	25	35	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1 22 515111	3	30	45	2	2	1	1	1	7	11	12	12	10	10	5	3	3	0	0	0	0	0	0	0

USUAL TIME, JFC 15 20 UNSTIPULATED

SECTION ENTER 1550M SP, RUMBERY SGT, ARMO P/I, FT. SILL + AT THE AGE OF 18 ** VIETNAM

155 S.P. SUN CHEE

REVISIT : 5

NEW TASKS

УДМУРТИЯНЫ ТАРАС

[illegible][illegible][illegible]

I WAS A GUNNER IN A "TRUCK" UNIT TO GUNNERY AND THEN TO FEBRUARY 1962 I PCS TO FT. SILL AND I WAS A GUNNER UNTIL 2 JUNE 1982 THEN I BECAME SECTION CHIEF ON A "55MM" HOWITZER

0=NO INCREASE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN C&F#1

02 : 11351AKJ11154

CREW TASKS:

URGENT TASKS

[illegible]

CUMULATIVE, CUMULATIVE, CUMULATIVE

0210 INCREASE ABOVE USUAL TIME
-12 CANONIC DO IT AT ALL
0200 END MEPLY
0200 MEPLY (FOR CONFUENCE)

155 S.P. GUN CREW

UNIMPADE DATA
GRUP : 155 S.P. GUN CREW
MOS : 155 S.P. GUN CREW
IN ARMY : 155 S.P. GUN CREW
IN ARTILLERY : 155 S.P. GUN CREW
WHEN : 155 S.P. GUN CREW
HOW LONG : 155 S.P. GUN CREW
WHEN : 155 S.P. GUN CREW
HOW LONG : 155 S.P. GUN CREW

COMBAT : 155 S.P. GUN CREW
ARTILL. COMBAT : 155 S.P. GUN CREW
SUPERVISED : 155 S.P. GUN CREW

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	LIMB	STAIRS	LIFT	WALK	LIFT	UPEN	CH. SECT	SLT	TRAV	GUNNER	SET	FLEV	LIFT	POS	PLACE	INS	FINE	SWAH	INSPECT
USUAL TIME, SEC	12	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
1 28 411111	4	50	55	3	5	5	5	15	7	10	12	12	15	15	15	15	15	15	15	15	15
1 28 515431	4	40	60	2	3	3	3	30	20	15	20	15	15	15	15	15	15	15	15	15	15
1 28 114111	4	40	60	1	3	3	3	40	10	10	15	15	10	10	10	10	10	10	10	10	10
1 28 515111	4	40	60	2	3	3	3	999	10	10	15	15	12	12	12	12	12	12	12	12	12
1 28 213111	4	40	60	2	3	3	3	30	8	10	10	10	9	9	9	9	9	9	9	9	9
1 28 413111	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 311111	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 515223	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 414112	4	40	60	1	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 515111	4	40	60	0.5	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 112111	4	40	60	0.3	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 514111	4	40	60	0.3	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 313112	4	40	60	1	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 515112	4	40	60	0.3	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 515111	4	40	60	0.3	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 123111	4	40	60	0.5	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 314231	4	40	60	0.3	3	3	3	40	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 115111	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 521111	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 113121	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 211111	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 224111	4	40	60	2	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 413112	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 312111	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 314112	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 314113	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 412111	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 414111	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15
1 28 515111	4	40	60	0.3	3	3	3	30	10	15	15	15	15	15	15	15	15	15	15	15	15

0=NO INCREASE ABOVE INITIAL TIME
 -1=CANNOT UN IT AT ALL
 9999=NO REPLY
 0=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA
 GRADE : E-7
 MOS : 15040
 IN ARMY : 16YR
 IN ARTILLERY : 15YR
 WHEN :
 COMBAT : IN
 ARTILL. CORPATION :
 SUPERVISED : 10

CREW TASKS

ORDINARY TASKS

CREW STAFF UNIFORM STAIRS POXES STAIRS WALK LIFT UNXFS LIFT UPEN CALL QUAD FLEV
 REFP

USUAL TIME/SEC 15 20 UNSTIPULATED

1	30	411111	3	30	40	3	15	4	20	15	15	15	15	15	20	20	35	9	17	12	13	15	15	15	10	7	5	2	3	1.5	1.5	3
1	30	515031	3	35	45	2	15	3	20	15	15	15	15	15	20	20	35	9	17	12	13	15	15	15	10	7	5	2	3	1.5	1.5	3
1	30	114111	3	20	25	5	15	5	25	15	15	15	15	15	20	20	35	9	17	12	13	15	15	15	10	7	5	2	3	1.5	1.5	3
1	30	515111	3	30	30	2	15	3	25	15	15	15	15	15	20	20	35	9	17	12	13	15	15	15	10	7	5	2	3	1.5	1.5	3
1	30	215111	3	0	0	0	25	6	6	6	6	6	6	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
1	30	415111	3	10	25	5	20	6	6	6	6	6	6	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
1	30	311111	3	0	0	0	25	6	6	6	6	6	6	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
1	30	315111	3	20	25	5	15	5	25	15	15	15	15	15	20	20	35	9	17	12	13	15	15	15	10	7	5	2	3	1.5	1.5	3
1	30	515223	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	30	414111	3	35	45	3	10	4	12	12	12	12	12	12	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	515111	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	30	112111	3	25	40	3	13	3	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	514111	3	00	50	2	10	4	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	315112	3	37	56	2	10	4	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	315113	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	30	315111	3	22	35	5	12	3	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	125111	3	22	37	4	17	5	13	13	13	13	13	13	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	314231	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	30	115111	3	0	0	6	20	6	6	6	6	6	6	6	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
1	30	521111	3	20	23	5	15	4	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	315121	3	19	26	5	10	4	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	211111	3	0	0	6	22	5	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	224111	3	21	20	4	12	4	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	415311	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	30	312111	3	21	20	4	12	4	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	314112	3	25	50	2	11	5	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	314113	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	30	412111	3	17	20	6	15	4	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	414111	3	24	31	4	10	4	10	10	10	10	10	10	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
1	30	525111	3	-1	-1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

CHIEF OF FIRING DEPT. SUPERVISE AND TRAIN CHIEF OF SECTION TO RE LEADER, IN DEVELOPED THE YOUNG SOLDIER OF TOMMORROW, HOW TO
 SURVIVE IN COMBAT.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

UNIFORMS DATA
 GRADE SF-7
 MOS 313040
 IN ARMY 313040
 IN ARTILLERY 313040
 CH. OF SECTION: 73
 GUNNER 70
 AS. GUNNER 69
 LOADER 68
 HOW LONG
 MO YR
 73 4
 70 4
 69 1
 68 1

COMBAT IN
 ARTILL. COURTESY
 SUPERVISED 1950

CREW TASKS

UNIFORM TASKS

CREW WSP	GUNP COMP	GUN CLIMB STAIRS	LIFT MOVES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	CH. SECT CALL QUAD ELFV	GUNNER SET DEF LEVEL	AST. GUNNER SET QUAD LEVEL ELEV	LOADER							
											SET QUAD LEVEL ELEV	PLAC OP CHARGE	INS PRIM	FINE SMAR	INSPECT			
USUAL TIME	SFC	15	20	UNSTIMULATED					5	7	7	3	2	5	2	1.5	1.5	5

1 31 411111	8	0	-1	3	15	10	60	0	0	0	5	-1	0	0	5	0	5
1 31 513031	8	-1	30	0.5	2	2	60	20	20	20	30	-1	-1	-1	-1	10	5
1 31 114111	8	20	30	3	1	9	60	10	15	15	15	20	4	4	3	0	6
1 31 515111	8	25	60	2	2	15	60	10	25	25	25	30	10	10	3	10	10
1 31 213111	8	20	30	2	2	15	60	5	9	9	7	5	4	3	2	5	5
1 31 413111	8	25	60	2	3	6	60	5	9	9	10	15	12	5	3	2	5
1 31 311111	8	20	30	5	5	10	60	6	9	9	5	5	6	3	2	2	5
1 31 313111	8	20	30	8	5	10	60	6	9	9	5	5	7	3	2	0	5
1 31 515223	8	25	60	2	1	2	60	15	20	20	15	-1	-1	10	6	4	6
1 31 414112	8	-1	-1	1	0.3	2	60	20	45	45	30	-1	-1	-1	10	10	15
1 31 515111	8	25	60	1	0.3	2	60	20	20	20	30	-1	-1	-1	10	10	15
1 31 112111	8	20	30	499	499	499	60	999	999	999	999	999	999	999	999	999	999
1 31 514111	8	25	60	3	5	10	60	8	15	15	10	30	20	10	5	5	6
1 31 313112	8	25	60	2	1	3	60	10	15	15	25	-1	-1	10	10	10	10
1 31 515113	8	25	60	1	0.3	3	60	10	15	15	25	-1	-1	10	10	10	10
1 31 513111	8	25	60	3	1	3	60	10	15	15	25	-1	-1	10	10	10	10
1 31 123111	8	-1	-1	1	0.3	3	60	15	20	20	15	-1	-1	10	10	10	10
1 31 314231	8	-1	-1	1	0.3	3	60	15	20	20	15	-1	-1	10	10	10	10
1 31 113111	8	20	30	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31 515111	8	25	60	10	15	20	60	5	10	10	6	4	7	3	2	2	4
1 31 521111	8	25	60	0.5	2	10	60	10	12	12	10	25	15	10	5	5	8
1 31 113121	8	20	30	10	10	20	60	10	10	10	10	20	15	10	5	5	8
1 31 211111	8	25	60	10	10	15	60	10	10	10	10	25	15	10	5	5	8
1 31 224111	8	-1	-1	1	0.3	3	60	10	10	10	25	-1	-1	10	10	10	10
1 31 415310	8	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31 512111	8	25	60	5	5	10	60	6	15	15	10	15	10	6	5	5	8
1 31 514112	8	-1	-1	2	1	3	60	20	30	30	25	-1	-1	10	10	10	10
1 31 314113	8	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31 412111	8	25	60	6	3	10	60	10	15	15	10	8	10	3	2	2	5
1 31 414111	8	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31 525111	8	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

A YEAR AGO I WAS STATIONED IN TURKEY. ALL OF MY DUTIES THERE WERE SPECIAL WEAPONS RELATED. I WAS ASSIGNED HERE THE END OF JUNE.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA
 GRADE : F-5
 MOS : 3130
 IN ARMY : SYN
 IN ARTILLERY : SYN
 COMBAT : 3M
 ARTIL. COMPAN :
 WHEN : 7 A2
 HOW LONG : 4
 CH. OF SECTION :
 GUNNER :
 AS. GUNNER :
 LOADER :
 #SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW RESP	STAMP	CON	CLIMB	STAIRS	WALK	LIFT BOXES	UPEN LOCK	LN. SECT	CALL QUAD FLEV	GUNNER SET TRA DEF LEVEL	AST. GUNNER SET QUAD ELEV	FLEV LEVEL	LIFT PRJCIL	POS OP CHARGE	INS PRIM	FINE	SMAR INSPECT
USUAL TIME	JFC	15	20	20	15	15	15	3	7	7	7	3	2	5	1.5	1.5	3
1 32 41111	3	30	30	3	15	5	10	5	10	15	10	7	10	10	4	3	5
1 32 515031	3	35	60	2	15	3	15	12	10	15	10	15	10	12	8	5	10
1 32 114111	3	30	-1	1.5	10	2	20	4	9	10	10	5	-1	7	-1	999	3
1 32 515311	3	30	-1	2	10	3	15	5	15	15	12	10	-1	10	-1	5	2.5
1 32 213111	3	20	30	3	20	4	10	0	0	9	0	5	5	0	5	3	10
1 32 413111	3	25	45	4	12	4	15	4	9	10	10	5	5	0	5	0	5
1 32 311111	3	20	35	3	20	4	10	5	0	10	0	6	15	0	5	3	5
1 32 313111	3	30	45	3	20	4	10	4	8	10	0	5	12	6	5	3	5
1 32 513223	3	35	-1	2	10	2	15	7	10	12	10	8	-1	10	-1	5	4
1 32 414112	3	30	-1	3	15	2	10	12	10	10	10	15	-1	10	-1	4	10
1 32 535111	3	-1	-1	1	7	1	12	12	15	15	15	15	-1	12	-1	5	10
1 32 112111	3	20	25	4.5	15	4	11	0	0	0	0	9	5	6	4	0	4
1 32 514111	3	30	-1	2.5	10	2	11	5	9	9	9	10	12	7	5	2	3
1 32 313112	3	-1	-1	-1	7	1	20	7	14	14	14	10	-1	8	-1	5	4
1 32 313113	3	-1	-1	-1	7	1	20	5	10	12	10	7	-1	11	-1	5	5
1 32 513111	3	-1	-1	-1	6	1	20	7	20	15	11	7	-1	-1	-1	5	12
1 32 123111	3	30	35	2	13	3	12	5	10	10	9	6	-1	8	-1	4	10
1 32 334331	3	-1	-1	1	16	1	15	10	12	15	12	10	-1	-1	-1	10	3
1 32 113111	3	20	25	4.5	15	4	11	0	0	0	0	0	5	6	-1	0	-1
1 32 521111	3	30	40	2.5	12	3	12	5	9	9	10	5	4	10	5	3	4
1 32 113121	3	30	40	2.5	10	2	10	7	10	10	10	6	-1	7	-1	5	4
1 32 211111	3	0	0	4	12	3	10	0	0	0	0	0	6	0	0	0	0
1 32 224111	3	30	35	1.5	10	2	10	-1	10	10	10	6	-1	7	-1	5	5
1 32 415112	3	-1	-1	1	5	1	25	7	10	10	10	6	-1	-1	-1	6	4
1 32 312111	3	30	45	3	20	4	10	4	4	8	6	5	12	6	-1	5	3
1 32 314112	3	20	-1	-1	10	2	15	5	9	8	9	6	-1	7	-1	3	4
1 32 314113	3	-1	-1	-1	7	1	20	7	10	14	14	10	-1	8	-1	5	4
1 32 412111	3	30	50	3	15	3	10	5	10	15	10	10	7	10	-1	3	0
1 32 414111	3	30	45	1	7	1	17	7	12	12	10	8	-1	7	-1	4	4
1 32 523111	3	-1	-1	1	6	1	17	7	10	10	10	8	-1	-1	-1	4	0

I HAVE BEEN A OPERATOR OF AN 155 SP HOWITZER AS WELL AS A GUNNER AND CHIEF OF SECTION I ALSO SERVED IN WEST BERLIN GERMANY FOR 2 YEARS.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 0=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA
 GRADE 3F-5
 MOS 1130
 IN ARMY 3 SYM
 IN ARTILLERY 3 SYM
 WHEN
 MUM LONG
 MO YR YR MO
 LN OF SECTION: 10 A2
 GUNNER : A2
 AS-GUNNER : A1
 LOADER : 90 1

#SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW SYMP LOW CLIMB LIFT CLIMB WALK LIFT UPPLN
 FUMP STAIRS ROYLS STAIRS
 RFSP

UNUSUAL TIME, SEC 15 20

CREW	SYMP	LOW	CLIMB	LIFT	CLIMB	WALK	LIFT	UPPLN	CALL	CH. SECT	SET	TRAV	DEF	LEVEL	GUNNER	ART. GUNNER	SET	ELEV	UPAD	ELEV	LIFT	PRCIL	RAMMEN	POS	CHARGE	INS	FINE	SNAB	INSPECT
1	33	41111	3	30																									
1	33	51505	2	-1																									
1	33	11311	0	70																									
1	33	51511	0	-1																									
1	33	21511	3	30																									
1	33	41511	0	30																									
1	33	31511	0	30																									
1	33	51511	3	30																									
1	33	51523	1	-1																									
1	33	41412	3	30																									
1	33	51511	0	00																									
1	33	11211	0	20																									
1	33	51411	0	00																									
1	33	31312	3	00																									
1	33	51511	0	-1																									
1	33	51311	7	05																									
1	33	12511	3	-1																									
1	33	34251	3	-1																									
1	33	11311	0	20																									
1	33	52111	0	25																									
1	33	11312	0	30																									
1	33	21311	0	30																									
1	33	41511	0	-1																									
1	33	41511	0	-1																									
1	33	51211	0	30																									
1	33	31411	0	00																									
1	33	31412	0	00																									
1	33	31411	0	-1																									
1	33	41211	3	30																									
1	33	41411	0	40																									
1	33	52511	0	-1																									

DEPARTMENTAL DATA
 GRADE : F-4
 HOS : 150
 IN ARMY : 500
 IN ARTILLERY : 700
 CH. OF SECTION : 79
 GUNNER : 77
 AS. GUNNER : 76
 LOADER : 75
 WHEN : 79
 HOW LONG : 3
 YR : 2
 YR : 1
 YR : 1

155 S.P. GUN CREW

0810 INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

COMBAT : 20
 ARTILL. LOCATION : 5

UNSUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW RESP	SWP	COMP	CON	CLIMB	LIFT	MOVES	STAIRS	WALK	LIFT	UNL	UPEN	LOCK	CH. SECT	GUNNER		AST. GUNNER		LOADER			
														SET	TRAV	DEF	LEVEL	SET	FLV	HEAD	LEVEL
USUAL TIME, SEC	15	20	UNSTIPULATED										3	7	7	3	2	5	1.5	1.5	3

CLASS S.P. FIN CHEN

UNCLASSIFIED : 10

CREW TASKS

ADDITIONAL TASKS

NEWSP	STAMP	COMP	STAMP	LIFT	CLIMB	WALK	LIFT	UPEN	CALL	CH. SECT	RUNNER			AST. GUNNER			LOADER				
											SET	TRAV	DEF	LEVEL	SET	ELEV	LIFT	PRJCTL	POS	PLACE	INS
1	39	411111	0	-1	3	30	5	15	5	3	7	7	3	2	5	2	1.5	1.5	3		
1	39	515431	3	-1	-1	30	5	15	15	5	0	14	5	6	10	7	4	3	4		
1	39	114111	0	30	1	20	3	15	15	15	0	10	7	-1	0	3	2	0	0		
1	39	515311	0	-1	1	12	5	25	6	6	10	10	5	10	7	5	3	3	0		
1	39	213111	0	25	4	30	5	15	6	6	0	0	5	4	0	4	3	0	0		
1	39	415111	0	20	3	25	6	15	5	5	0	0	0	4	0	0	0	0	0		
1	39	311111	0	0	6	70	6	15	4	4	0	0	0	0	0	0	0	0	0		
1	39	313111	0	20	4	40	4	4	4	4	0	0	0	0	0	0	0	0	0		
1	39	515231	5	-1	1	15	15	15	4	4	0	10	7	-1	0	3	2	0	0		
1	39	414112	0	-1	2	15	1	15	6	6	14	15	6	-1	0	4	3	0	0		
1	39	515111	0	-1	-1	15	15	15	9	9	18	15	7	-1	10	-1	4	4	6		
1	39	112111	0	0	7	70	7	0	0	0	0	0	0	0	0	0	0	0	0		
1	39	514111	0	20	20	20	1	15	6	6	15	14	5	6	0	6	4	3	0		
1	39	513112	0	25	3	20	2	5	5	5	12	10	5	4	0	4	3	0	0		
1	39	515112	0	-1	-1	15	-1	15	10	10	-1	-1	-1	-1	-1	-1	-1	-1	-1		
1	39	513111	0	20	3	30	4	15	5	5	15	15	0	5	0	4	3	0	0		
1	39	123111	0	35	4	60	1	25	4	4	0	0	0	6	0	6	6	3	3		
1	39	342311	0	-1	-1	5	1	25	9	9	15	20	6	-1	0	0	0	0	0		
1	39	113111	0	0	6	70	5	0	0	0	0	0	0	0	0	0	0	0	0		
1	39	521111	0	20	6	60	5	0	7	7	15	15	7	6	0	0	0	0	0		
1	39	113121	0	20	3	50	3	0	6	6	10	10	5	4	0	4	0	0	0		
1	39	211111	0	20	5	60	2	10	9	9	0	0	0	4	0	5	4	3	3		
1	39	224111	0	-1	15	15	1	10	9	9	15	15	6	-1	0	0	-1	-1	-1		
1	39	415114	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
1	39	312111	0	20</																	

DECLASSIFIED INTO ARTILLERY: BY DULLES AS FDC NCIC OF A BRIGAD. IACFIRE. SUPPORT OF BN ARTIF'S

GRADE : IF-7
 MDS : 1304T
 IN ARMY : 15YR
 IN ARTILLERY : 6
 COMBAT : 10
 ARTILL. CORPUS : 10
 SUPERVISED : 10

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

CREW TASKS									
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0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CNEW

DEMOGRAPHIC DATA
 GRADE : F-A
 MUS : 13510
 IN ARMY : SVR 2ND
 IN ARTILLERY : SVR 2
 COMBAT IN
 ANTL. COMBATIN
 WHEN : 176 3 1
 FDC HCU : P A1 1 9
 FDC COMPUTER : P A1 1 9
 WHEN : 176 3 1
 FDC HCU : P A1 1 9
 FDC COMPUTER : P A1 1 9
 WHEN : 176 3 1
 FDC HCU : P A1 1 9
 FDC COMPUTER : P A1 1 9

CHEW TASKS

ROUTINARY TASKS

CREW RESP COMP	SYMP CON CLIMB STAIRS	LIFT CLIMB STAIRS	WALK STAIRS	LIFT BOXES	OPEN LOCK	FDU				HCO				COMPUTER		
						SAY MISN	REVIEW CALC	SAY ORDER	PLOT TGT	ORIENT RDP	HEAD RANGE	CALC D O	SAY SET			
USUAL TIME, JFC	15	20	UNTIMPULATED				2	5	3	1	1	3	15	3		
2 4 411111 3	45	60	1	0.5	2	40	A	6	10	0	0	0	30	13		
2 4 515031 0	-1	-1	0.2	-1	-1	122	-1	0	-1	0	0	0	-1	-1		
2 4 114111 3	45	60	3	1	3	60	10	4	7	0	0	0	20	5		
2 4 515311 3	-1	-1	-1	-1	1	-1	-1	5	-1	6	-1	-1	-1	13		
2 4 213111 3	30	40	3	2	4	35	12	10	5	0	13	30	0	A		
2 4 311111 3	25	50	3	2	5	35	5	5	A	0	10	25	0	A		
2 4 313111 3	30	50	3	1.5	3	35	5	A	A	0	10	30	0	13		
2 4 515221 3	-1	-1	-1	-1	1	-1	22	23	-1	-1	-1	-1	-1	-1		
2 4 414112 3	60	-1	2	0.5	2	60	12	15	7	0	5	25	13	-1		
2 4 515111 3	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1		
2 4 112111 3	20	25	3	2	6	20	0	0	0	0	0	20	0	5		
2 4 514111 3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
2 4 315111 3	-1	-1	-1	-1	-1	-1	-1	30	32	7	10	30	10	13		
2 4 513111 3	-1	-1	-1	-1	-1	-1	60	-1	30	6	-1	-1	-1	-1		
2 4 123111 3	-1	-1	-1	-1	-1	-1	3	4	0	0	0	20	0	5		
2 4 314231 3	30	160	2	1	5	20	12	15	13	0	0	30	0	13		
2 4 113111 3	20	30	3	2	6	20	0	0	0	0	0	0	0	0		
2 4 521111 3	-1	-1	-1	-1	-1	-1	60	-1	13	6	-1	-1	-1	13		
2 4 211111 3	20	25	3	1.5	5	30	30	15	0	0	0	20	5	5		
2 4 224111 3	20	25	3	2	3	25	30	30	20	0	5	25	5	5		
2 4 415311 3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
2 4 214131 3	30	-1	2	1	-1	45	-1	-1	-1	-1	-1	-1	-1	-1		
2 4 112121 3	20	30	3	2	4	35	12	20	10	0	10	25	7	7		

DIRECTION OF FIRE FOR BATTALION, MAINTENANCE: SECTION, EQUIPMENT-VEHICLES : PHYSICAL ENVIRONMENT; CHITIG GRASS, SWEEPING ASPHALT
 STATING OUT OF LEGAL/FINANCIAL TROUBLES

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE :FC-4 FDC HCU :MO YR YR MO
 MOS :15C FDC COMPUTER :10 A2 2
 IN ARMY :2YR 6MO
 IN ARTILLERY :2YR 6
 COMBAT IN
 ARTIL. COMBAT : 5
 SUPERVISED : 5

CREW TASKS									

CREW TASKS									

CREW TASKS									

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0=NO INCREASE ABOVE USUAL TIME
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 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 :F-5 FDC HCU : 10 YR YR MO
 :13C FDC COMPUTER : A1 1
 IN ARMY : 0YR
 IN ARTILLERY : 2YR

COMBAT IN
 ARTILL. COMPAT: 4 SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW RESP COMP	USUAL TIME, SEC	CON CLIMB STAIRS	LIFT RUDES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	FDC				HLO				COMPUTER			
								SAY MISN	REVIEW CALC	SAY ORDFR	PLOT TGT	ORIENT RDP	HEAD RANGE	CALC U	SAY SET				
2	7 411111	0	50	6	45	25	50	2	5	3	1	1	3	15	3				

2	7 515031	0	-1	2	20	45	30	5	10	10	10	7	8	0	10				
2	7 114111	0	50	3	25	5	35	10	7	0	0	0	0	20	15				
2	7 515111	0	-1	2	15	2	45	10	7	10	0	5	7	30	10				
2	7 213111	0	35	4	35	7	30	0	0	0	0	0	0	0	0				
2	7 413111	0	35	5	40	7	40	0	0	0	0	0	0	0	0				
2	7 313111	0	35	4	45	7	30	5	7	10	0	0	0	0	0				
2	7 313111	0	60	4	35	6	30	5	9	10	10	0	7	0	10				
2	7 515223	0	-1	-1	15	5	60	15	10	20	10	7	10	20	10				
2	7 414112	0	75	2	25	10	35	7	10	9	0	10	7	20	10				
2	7 535111	0	-1	2	25	4	30	15	10	10	10	10	10	25	10				
2	7 112111	0	40	4	55	6	25	0	0	0	10	7	6	0	0				
2	7 514111	0	55	4	30	5	40	5	10	10	7	7	6	0	10				
2	7 313112	0	45	4	30	6	35	5	10	10	0	7	6	0	10				
2	7 515112	0	65	2	25	3	45	5	10	10	10	8	6	20	10				
2	7 515111	0	60	2	55	3	20	6	7	7	6	6	7	0	10				
2	7 123111	0	45	0	60	5	15	0	0	0	0	0	0	0	10				
2	7 334231	0	60	2	25	3	45	10	10	10	7	6	7	0	10				
2	7 113111	0	45	3	45	6	30	5	7	6	7	5	6	0	10				
2	7 521111	0	40	2	50	4	20	3	0	0	7	8	5	0	10				
2	7 113121	0	40	2	30	4	45	6	10	7	10	6	6	0	10				
2	7 211111	0	40	2	45	3	45	5	7	5	10	6	7	0	10				
2	7 224111	0	60	2	40	3	25	10	15	10	10	7	6	0	10				
2	7 415310	0	-1	2	25	-1	20	10	10	10	10	7	5	0	10				
2	7 312111	0	40	2	20	2	15	6	10	7	10	7	5	0	10				
2	7 314112	0	60	2	25	6	35	5	10	7	7	7	6	0	10				
2	7 314112	0	60	2	25	6	25	0	0	0	0	0	0	0	10				
2	7 314112	0	65	2	25	4	25	0	0	0	0	0	0	0	10				
2	7 412111	0	60	2	25	3	25	0	0	0	0	0	0	0	10				
2	7 414111	0	60	2	25	3	25	0	0	0	0	0	0	0	10				
2	7 525111	0	75	2	25	4	35	5	10	7	10	7	6	0	10				

FDC RELATED DUTIES AS HLO VDC COMPUTER, HMC ASSISTANT.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 MO YR YR MO
 GRADE 3F-4 FDC HCU FDC COMPUTER : M1 1 A
 MUS 315F
 IN APNY : 2YR 6MO
 IN ARTILLERY : 2YR 6
 COMBAT IN
 ARTIL. CORPATION #SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	LOW	CLIMB	LIFT	UPEN	FDC			HCU			COMPUTER		
						WALK	BOXES	LOCK	WALK	BOXES	LOCK	WALK	BOXES	LOCK
USUAL TIME, SEC	15	20	20	20	20	UNSTIMULATED								
2 8 41111	3	20	30	15	5	3	15	3	10	10	10	20	20	6
2 8 51531	3	-1	-1	2	15	5	5	15	5	15	5	20	25	6
2 8 11411	0	0	30	3	5	5	10	5	0	7	0	20	20	5
2 8 51531	0	-1	30	3	5	5	5	6	0	10	0	20	20	0
2 8 21311	0	0	0	10	0	0	10	4	0	7	0	0	0	5
2 8 41311	0	17	0	10	0	0	0	5	0	6	4	0	0	5
2 8 31111	0	0	0	0	5	0	10	5	0	7	0	0	0	5
2 8 31311	0	0	0	7	10	10	10	6	0	7	0	0	0	5
2 8 51521	0	30	35	3	5	5	5	0	0	0	0	0	0	4
2 8 41412	0	25	-1	2	0	0	4	0	5	10	5	20	7	5
2 8 53511	0	0	40	1	2	2	4	7	0	10	4	0	0	5
2 8 11211	0	0	0	10	0	0	0	5	0	7	0	0	0	4
2 8 51411	0	20	25	6	10	10	7	7	0	7	4	0	0	4
2 8 31312	0	0	0	10	0	0	0	5	0	7	4	0	0	4
2 8 51513	0	-1	-1	3	0	0	0	10	3	7	0	10	0	4
2 8 51311	0	20	0	10	0	0	0	7	0	7	0	0	0	4
2 8 12311	0	0	0	10	0	0	0	4	0	0	0	0	0	0
2 8 33423	0	30	-1	2	3	3	10	5	0	10	5	20	5	5
2 8 11311	0	0	0	10	0	0	0	5	0	7	0	0	0	0
2 8 52111	0	20	30	0	0	0	5	7	0	7	0	0	0	4
2 8 11312	0	0	0	0	0	0	0	5	0	0	0	0	0	4
2 8 11312	0	0	0	0	0	0	0	5	0	0	0	0	0	4
2 8 21111	0	0	0	0	0	0	0	5	0	0	0	0	0	4
2 8 41511	0	-1	-1	1	1	1	12	5	5	12	5	25	6	6
2 8 31211	0	0	0	0	0	0	0	5	0	0	0	0	0	4
2 8 31412	0	0	0	0	0	0	0	5	0	0	0	0	0	4
2 8 31413	0	-1	-1	3	5	5	3	7	4	6	4	0	0	4
2 8 41211	0	0	0	0	0	0	0	5	0	6	4	0	0	4
2 8 41411	0	0	0	0	0	0	0	7	0	6	4	0	0	4
2 8 52511	0	-1	-1	2	5	5	3	0	4	10	4	20	5	5

MY DUTIES AS A FDC CREW HAVE REMAINED ANYWHERE FROM 57/01 (THANK) MAINTENANCE IN COMPUTERS; RIO; FDC HCU, FDC VCU, IN CHEMICAL SURVEY TEAM. * ONE AND ONE

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 99=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA
 GRADE : 1E-7
 MOS : 13510
 IN ARMY : 2YR 5MO
 IN ARTILLERY : 2YR 5
 COMBAT : 2M
 ARTIL. COMBAT : 5
 SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW #FSP	COMP	LOW CLIMB STAIRS	LIFT MOVES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	FDC			MCO			COMPUTER		
								MISN	SAY REVIEW	SAY URFR	PLUT TGT	ORIENT NDP	READ RANGE	CALC U	SAY U	SET
USUAL TIME, SEC								2	5	3	1	1	3	15	3	
2	9	41111	4	21	3	30	5	10	0	6	6	8	0	5	0	5
2	9	51503	4	-1	3	5	5	23	10	6	6	9	25	6	25	7
2	9	11411	4	10	3	15	5	12	0	0	0	0	20	4	4	5
2	9	51531	4	-1	1	1	1	25	5	7	0	7	20	5	5	5
2	9	21311	5	17	3	25	3	18	0	0	0	6	17	4	4	4
2	9	41311	5	19	2	20	3	15	6	0	0	6	15	5	5	5
2	9	31111	4	17	3	25	3	15	4	0	0	6	0	4	0	4
2	9	31311	4	10	3	20	3	15	4	0	0	6	0	4	4	4
2	9	51522	5	-1	1	1	2	22	6	7	0	10	23	6	23	4
2	9	41412	4	25	3	20	3	19	5	6	0	6	19	4	19	5
2	9	53511	5	-1	1	10	1	20	6	9	0	8	27	7	27	8
2	9	11211	5	17	3	30	4	18	0	0	0	0	17	0	17	0
2	9	51411	4	30	1	15	2	21	4	7	0	7	23	5	23	6
2	9	31312	4	-1	1	15	2	19	4	6	0	6	20	4	20	5
2	9	31513	4	-1	1	7	1	25	6	9	0	6	29	6	29	7
2	9	51311	4	20	1	20	2	19	5	7	0	6	17	4	17	4
2	9	12311	4	23	1	10	2	19	3	6	0	6	17	4	17	4
2	9	33423	5	-1	1	5	2	22	5	6	0	7	22	5	22	4
2	9	11311	4	10	3	15	5	12	5	0	0	0	20	4	20	5
2	9	52111	4	25	3	20	5	19	5	6	0	6	19	5	19	5
2	9	11321	5	20	3	25	3	17	4	0	0	6	18	4	18	4
2	9	21111	5	0	3	25	3	18	3	6	0	6	18	4	18	4
2	9	22511	4	29	1	10	2	20	5	8	0	9	21	6	21	6
2	9	41314	5	-1	1	0	1	30	11	15	0	11	40	10	40	10
2	9	31211	5	19	2	15	3	19	6	6	0	0	18	5	18	5
2	9	31412	4	20	2	12	2	21	5	9	0	8	21	7	21	7
2	9	31411	4	-1	1	8	2	22	6	9	0	9	22	9	22	9
2	9	41211	5	20	3	25	3	17	4	0	0	6	18	4	18	4
2	9	41411	5	19	3	20	2	19	5	0	0	7	17	5	17	5
2	9	52511	5	-1	1	6	1	27	7	13	0	10	31	8	31	8

IN THE PAST YEAR I HAVE SUPERVISED THE OPERATION OF THE AIRY FDC AND BDC, WHILE ALSO OPERATING AS THE CHIEF COMPUTER.

UFIROGRAPHIC DATA

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

GRAVE : IF-4 WHEN : HOW LONG :
 MDS : 115030 FDC HCU : NO YH YH MO : 6
 IN ARMY : 5YR FDC COMPUTER : 78 4
 IN ARTILLERY : 5YR

COMBAT : IN :
 ARTILL. COMMAND : SUPERVISED : 10

CREW TASKS

UPDUTARY TASKS

CREW	STMP	LOW	CLIMB	LIFT	WALK	LIFT	OPEN	FDD				MCD				COMPUTER			
								SAY	REVIEW	SAY	URDEN	PLOT	ORIENT	HEAD	RANGE	CALC	SAY	SET	
USUAL	TIME	SEC	15	20	20	20	20	MISN	URDEN	URDEN	URDEN	TGT	RDY	RDY	RDY	U	U	U	U
2	10	41111	4	17	21	6	10	3	6	6	6	7	0	5	19	19	6		
2	10	515031	5	-1	-1	1	2	3	6	6	6	10	0	7	23	23	6		
2	10	11111	4	17	23	3	5	6	6	6	6	6	0	4	18	18	0		
2	10	51511	5	10	-1	1	1	5	6	6	6	9	0	7	20	20	7		
2	10	21511	5	16	22	7	6	4	0	0	0	6	0	5	0	0	5		
2	10	41511	5	16	26	4	7	5	0	0	0	7	0	5	18	18	6		
2	10	31111	5	16	21	8	9	3	0	0	0	0	0	4	0	0	4		
2	10	31511	5	19	26	3	4	3	0	0	0	6	0	4	17	17	4		
2	10	515223	5	-1	-1	1	2	5	6	6	6	7	0	6	20	20	5		
2	10	914112	4	-1	-1	1	1	4	6	6	6	7	0	6	20	20	6		
2	10	51511	5	-1	-1	1	1	5	7	7	7	8	0	6	20	20	6		
2	10	11211	5	16	22	1	7	5	0	0	0	0	0	6	16	16	0		
2	10	51411	4	909	-1	2	3	0	6	6	6	0	0	4	17	17	5		
2	10	315112	4	22	26	2	5	3	6	6	6	6	0	4	18	18	4		
2	10	315113	4	-1	-1	1	1	3	7	7	7	7	0	5	20	20	5		
2	10	51511	5	17	26	3	6	5	0	0	0	8	0	6	17	17	0		
2	10	12511	5	17	24	6	6	0	0	0	0	0	0	6	25	25	6		
2	10	315231	4	-1	-1	1	2	5	8	8	8	0	0	0	17	17	0		
2	10	11511	5	16	22	6	7	0	0	0	0	0	0	0	18	18	5		
2	10	52111	4	16	24	5	5	0	6	6	6	7	0	4	18	18	0		
2	10	115121	4	19	25	3	4	3	6	6	6	6	0	4	0	0	4		
2	10	21111	5	0	21	6	5	3	0	0	0	0	0	4	0	0	4		
2	10	22411	4	26	-1	2	3	3	6	6	6	7	0	5	20	20	5		
2	10	415314	5	-1	-1	1	2	5	7	7	7	0	0	7	22	22	6		
2	10	31211	4	16	25	3	7	3	0	0	0	6	0	4	18	18	5		
2	10	314112	4	-1	-1	1	2	3	6	6	6	6	0	4	18	18	4		
2	10	314113	5	-1	-1	1	2	3	6	6	6	7	0	5	18	18	4		
2	10	41211	4	20	24	4	7	4	6	6	6	7	0	5	19	19	5		
2	10	41411	4	24	-1	3	2	4	6	6	6	7	0	5	19	19	5		
2	10	52511	4	-1	-1	1	2	4	6	6	6	7	0	5	19	19	4		

DEFENDING DATA WHEN HOW LONG
 GRADE : F-5 FDC HCU : A1 YR H0 5
 MUS : 13620 FDC COMPUTER : A2 3
 IN ARMY : 5YR 640
 IN ARTILLERY : 5YR 5
 COMBAT : 30
 ARTILL. COMPATED :
 #SUPERVISED : 5

0END INCREASE ABOVE USUAL TIME
 -1ECANNOI DO IT AT ALL
 9990END REPLY
 9END REPLY (FOR CONFIDENCE)

PIPE UTRECTION CENTER CREW

CREW TASKS

ORDINARY TASKS

CREW RESP PUMP	STALPS	LOW CLIMB BOXES	CLIMB STAIRS	WALK	LIFT BOXES	LIFT OPEN	FDC				HCD				COMPUTER			
							SAY MISM	REVIEW CALC	SAY ORDER	PLUT TGT	ORIENT MDP	HEAD RANGE	CALC U Q	SAY SET				
USUAL TIME:SEC	15	20	20	DISSEMINATED			2	5	3	1	1	3	15	3				
2 12 41111	4	20	20	30	20	7	3	0	0	0	0	0	0	0	4			
2 12 515431	7	45	50	5	3	0	8	12	7	9	6	6	20	7				
2 12 114111	4	0	0	60	12	5	0	0	0	0	0	0	0	0	5			
2 12 515311	7	25	40	5	7	5	5	7	7	7	5	5	20	0				
2 12 213111	4	20	25	4	8	5	0	0	0	6	4	0	0	0	0			
2 12 413111	4	25	30	2	5	7	3	0	4	6	4	0	16	4				
2 12 311111	4	35	35	1	3	0	4	6	4	7	6	5	18	5				
2 12 313111	7	30	28	2	3	7	5	7	5	7	5	5	18	6				
2 12 515223	7	50	50	1	2	10	6	7	7	15	8	6	22	7				
2 12 414112	7	20	30	4	7	5	3	0	4	6	4	0	0	4				
2 12 535111	4	30	50	1	1	20	8	8	6	10	6	6	20	7				
2 12 112111	4	0	0	6	12	5	0	0	0	0	0	0	0	0				
2 12 514111	7	23	30	2	5	8	4	6	4	6	4	5	18	5				
2 12 313112	7	20	30	2	6	7	3	0	4	7	5	0	0	0				
2 12 315112	7	40	50	2	5	7	5	8	6	10	6	5	20	7				
2 12 513111	7	35	45	2	15	8	4	7	5	7	5	5	17	6				
2 12 123111	7	0	0	4	30	5	0	0	0	0	0	0	0	0				
2 12 314251	7	25	35	2	15	7	4	7	5	7	5	5	18	5				
2 12 113111	4	0	0	6	50	5	0	0	0	0	0	0	0	0				
2 12 521111	7	20	40	1	5	7	5	7	5	7	6	5	20	7				
2 12 113121	7	20	30	5	8	5	0	0	0	0	0	0	0	0				
2 12 211111	7	10	25	5	8	6	3	0	0	0	0	0	0	0				
2 12 224111	7	28	45	3	4	7	4	8	6	7	5	6	17	7				
2 12 415114	7	40	60	1	1	10	6	10	6	10	9	7	25	7				
2 12 312111	7	0	0	4	30	5	0	0	0	0	0	0	0	0				
2 12 314112	7	20	40	3	5	7	3	6	4	6	4	4	16	4				
2 12 314113	7	50	60	1	5	8	5	7	5	7	5	4	17	5				
2 12 412111	7	20	30	4	40	7	0	0	0	0	0	0	0	0				
2 12 414111	7	20	30	4	30	6	0	0	0	0	0	0	0	0				
2 12 523111	7	35	45	1	5	7	5	7	6	7	5	7	19	7				

I HAVE BEEN TACFIRE OPERATION SPECIALIST, ALSO AS ADDITIONAL DUTY I HAVE BEEN BN SCHOOL, A & R AND TRG NCO. * ALTERNATED

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA
 GRADE : 5F-5
 MOS : 313020
 IN ARMY : 4YR
 IN ARTILLERY : 4YR
 WHEN :
 M0 YN MO
 79 1 1
 FDC HCU : 3
 FDC COMPUTER : 79 1 1
 COMBAT : IN
 ARTIL. CORPATION :
 SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	STAIRS	LIFT	MOVES	CLIMB	WALK	LIFT	UPEN	FNU				HCU				COMPUTER		
											WISN	SAY	REVIEW	CALC	URQEN	PLUT	ONTENT	READ	CALC	SAY	SET
UNSTIPULATED												2	5	3	1	1	1	3	15	3	
2 13 41111	0	20	3	0	3	20	0	7	0	0	0	0	0	9	8	10	30	7			
2 13 51541	0	25	-1	0	-1	-1	15	15	15	10	0	0	0	-1	-1	-1	-1	-1			
2 13 11411	0	45	2	0	20	20	5	0	0	0	0	0	0	11	12	10	25	7			
2 13 51531	0	35	3	2	0	0	0	0	0	0	0	0	0	11	12	8	25	10			
2 13 21511	0	25	4	0	12	25	0	0	0	0	0	0	0	9	12	7	25	7			
2 13 41311	0	20	0	10	0	10	0	0	0	0	0	0	0	9	7	5	20	5			
2 13 31111	0	25	15	20	20	10	0	0	0	0	0	0	0	9	6	9	25	9			
2 13 31311	0	25	10	13	15	15	0	-1	0	-1	-1	-1	-1	9	10	12	35	15			
2 13 51521	0	25	-1	-1	-1	-1	-1	0	0	0	0	0	0	-1	-1	-1	-1	-1			
2 13 41412	0	25	5	7	15	15	10	10	7	10	5	5	5	14	12	15	25	10			
2 13 51511	0	20	-1	-1	-1	-1	0	0	0	0	0	0	0	11	17	10	30	10			
2 13 51411	0	20	0	15	15	15	0	0	0	0	0	0	0	8	7	5	20	5			
2 13 51312	0	20	2	0	-1	-1	7	10	7	10	5	5	5	-1	-1	-1	-1	-1			
2 13 31511	0	30	-1	0	20	20	10	12	10	10	12	10	10	11	12	7	35	12			
2 13 31511	0	30	15	10	15	15	0	0	0	0	0	0	0	11	12	10	-1	-1			
2 13 34251	0	30	5	10	20	20	0	0	0	0	0	0	0	9	7	5	25	7			
2 13 11511	0	30	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1			
2 13 31311	0	25	20	25	15	15	0	0	0	0	0	0	0	8	5	6	20	5			
2 13 52111	0	30	15	20	20	20	7	10	6	6	6	6	6	9	7	6	25	7			
2 13 11512	0	20	0	0	15	15	0	0	0	0	0	0	0	7	7	5	20	6			
2 13 21111	0	20	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1			
2 13 21111	0	20	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1			
2 13 41514	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1			
2 13 31211	0	25	4	3	20	12	7	10	6	6	6	6	6	9	7	5	30	7			
2 13 31412	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1			
2 13 31411	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1			
2 13 34111	0	20	6	10	10	15	0	0	0	0	0	0	0	11	9	6	20	6			
2 13 41211	0	-1	-1	-1	-1	-1	7	10	6	6	6	6	6	9	7	5	30	10			
2 13 41411	0	-1	-1	-1	-1	-1	7	10	7	10	5	5	5	9	0	5	20	6			
2 13 52511	0	25	2	-1	-1	-1	7	10	7	10	7	7	7	9	0	5	20	6			

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

OFFICER/GRAPHIC DATA
 GRADE : E-4
 MOS : 113750
 IN ARMY : 1137K
 IN ARTILLERY : 7YK
 WHEN : 75 1
 HOW LONG : 76 4
 FDC HCU : 75 1
 FDC COMPUTER : 76 4
 COMBAT : 1Y 4Y 71
 ARTILL. COMBAT : 10
 #SUPERVISOR : 10

CREW TASKS

ORDINARY TASKS

CREW RESP	SMP COMP	CON CLIMB STAIRS	LIFT ROYS STAIRS	LIFT BOXES	OPEN LOCK	FRU			HCU			COMPUTER			
						SAY WISN	REVIEW CALC	SAY ORDFR	PLOT TGT	ORIENT RDP	READ RANGE	CALC D G	SAY SET		
USUAL TIME, SEC															
15	20	HYPOTHETICAL				2	5	3	1	1	3	15	3		
2 14 411111	A	20	0	10	10	0	0	7	0	0	5	20	5		
2 14 515431	A	-1	-1	-1	-1	-1	-1	-1	19	12	20	25	30		
2 14 114111	A	0	35	4	10	0	0	0	0	0	0	0	0		
2 14 515311	A	70	45	-1	20	10	12	0	11	7	10	20	4		
2 14 215111	A	0	25	2	5	0	0	0	9	7	7	18	7		
2 14 415111	A	0	30	7	10	0	0	0	9	7	9	0	0		
2 14 311111	A	0	0	8	5	0	0	0	11	9	10	20	4		
2 14 315111	A	20	35	4	5	0	0	0	9	9	10	20	5		
2 14 515231	A	-1	-1	-1	10	4	7	5	9	5	8	20	10		
2 14 414112	A	20	25	-1	10	0	0	0	0	0	0	0	0		
2 14 515111	A	20	40	10	10	4	7	5	19	9	10	20	15		
2 14 112111	A	0	0	10	5	0	0	0	0	0	0	0	0		
2 14 514111	A	25	50	1	10	0	0	0	0	0	0	0	0		
2 14 315112	A	17	22	1	10	4	7	5	11	7	5	17	5		
2 14 515113	A	10	23	-1	-1	5	8	6	12	8	6	18	6		
2 14 123111	A	0	0	4	10	7	0	0	14	10	15	25	4		
2 14 315111	A	0	0	3	10	0	-1	0	12	7	10	0	0		
2 14 113111	A	25	-1	-1	10	-1	0	-1	14	10	0	0	0		
2 14 315111	A	20	40	7	10	0	0	0	0	0	0	0	0		
2 14 521111	A	20	40	7	5	0	0	0	0	0	0	0	0		
2 14 113121	A	25	35	4	10	0	0	0	13	0	10	0	0		
2 14 211111	A	0	60	7	10	0	10	0	0	0	10	0	0		
2 14 224111	A	70	60	1	10	7	10	0	12	0	10	20	8		
2 14 415314	A	60	90	-1	20	20	30	0	14	0	20	30	45		
2 14 312111	A	0	0	3	10	0	0	0	14	0	15	20	10		
2 14 314112	A	0	0	2	10	0	0	0	14	0	10	0	0		
2 14 314113	A	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	20	10		
2 14 412111	A	20	25	4	10	0	0	0	12	7	5	20	8		
2 14 414111	A	60	120	9	10	0	0	0	12	7	10	25	20		
2 14 525111	A	25	60	3	10	0	0	0	14	10	15	20	10		

SUPPORTING BY FDC IN TARGETING AND ACCURACY OF LANDING A ROUND ON TARGET/ HE / MHC AND VARIOUS COMBINATIONS OF ROUNDS. VOICE AND CIPHER OPERATIONS FOR ENCRYPT MESSAGES.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9590=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

UNDOGRAPHIC DATA
 IF-4 FDC HCU : 1 RI 2
 MOS : 13C10 FDC COMPUTER : 1 RI 2
 IN ARMY : 5YK AND
 IN ARTILLERY : 2YK A
 WHEN
 COMBAT IN
 ARTILL. COORDIN : 4SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	STAIRS	LIFT	CLIMB	WALK	LIFT	UPEN	FNU				HCO				COMPUTER			
										SAY	REVIEW	SAY	PLUT	ORIENT	HEAD	CALC	SAY				
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2	5	3	1	1	3	15	3	15	3		
										2											

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 NO YR YR NO
 GRADE : F-5 FDC HCU :
 MOS : 15C20 FDC COMPUTER :
 IN ARMY : 5YR 6MO
 IN ARTILLERY : 4YR 6
 COMBAT : 2M
 ARTILL. COMBAT : 10
 SUPERVISED : 10

CREW TASKS

ORDINARY TASKS

CREW RESP	SYMP CAMP	LOW CLIMB STAIRS	LIFT CLIMB BOXES STAIRS	WALK BOXES	LIFT BOXES	UPEN LOCK	FNU			HCU			COMPUTER		
							WISN	SAY REVIEW	ORDEN	PLUT TGT	ORIENT NDP	MEAN RANGE	CALC DO	SAY SET	
USUAL TIME, SEC							2	5	3	1	1	3	15	3	
2 16 41111	4	60	3	7	10	6	5	10	0	0	0	5	0	50	10
2 16 51503	4	-1	-1	-1	1	190	30	90	7	165	0	65	40	120	40
2 16 11411	4	-1	2	3	5	20	6	40	0	30	0	20	10	40	10
2 16 51511	4	-1	-1	1	2	60	50	70	0	60	0	15	15	50	20
2 16 21311	4	25	65	4	5	10	10	30	0	15	0	8	10	30	0
2 16 41311	3	50	2	10	8	10	4	10	0	9	0	9	10	30	15
2 16 31111	3	45	60	5	5	10	4	15	2	10	0	5	4	20	10
2 16 31311	3	65	2	2	6	20	4	10	5	10	0	6	10	50	20
2 16 51523	4	-1	-1	-1	-1	95	25	165	30	150	0	65	40	85	40
2 16 41412	3	-1	-1	-1	1	90	55	95	50	90	0	80	40	50	55
2 16 51511	4	-1	1	1	1	65	65	130	30	120	0	55	90	120	70
2 15 11211	4	25	3	12	10	20	0	7	0	0	0	5	5	20	5
2 16 51411	3	-1	-1	-1	-1	75	12	20	10	25	0	40	80	60	35
2 16 31312	3	110	-1	2	5	60	20	45	10	55	0	50	40	100	50
2 16 31511	4	-1	-1	-1	-1	120	40	65	25	125	0	60	100	180	50
2 16 51311	4	-1	-1	-1	-1	60	40	65	20	70	0	70	120	75	30
2 16 12311	4	-1	-1	5	-1	-1	-1	-1	5	-1	-1	-1	-1	-1	-1
2 16 31311	4	-1	-1	-1	-1	70	45	120	15	150	0	160	60	120	50
2 16 31423	4	-1	-1	-1	-1	50	0	0	0	7	0	6	6	25	6
2 16 11311	4	45	2	4	5	65	25	50	25	110	0	40	90	70	60
2 16 51111	4	-1	-1	-1	-1	55	20	40	30	55	0	70	45	60	40
2 16 11312	4	45	2	4	5	75	20	15	0	10	0	15	15	25	10
2 16 21111	4	45	2	4	5	70	40	45	7	-1	0	-1	-1	-1	15
2 16 21411	4	-1	-1	-1	-1	-1	45	-1	20	-1	-1	-1	-1	-1	45
2 16 41514	4	-1	-1	-1	-1	-1	45	-1	20	-1	-1	-1	-1	-1	-1
2 16 31211	4	70	2	4	4	60	20	20	10	25	0	20	15	40	10
2 16 31412	4	-1	-1	-1	-1	65	20	45	10	40	0	70	55	60	25
2 16 31413	4	-1	-1	-1	-1	60	20	40	10	40	0	40	40	75	15
2 16 41211	4	45	2	4	3	75	15	20	10	20	0	25	40	55	40
2 16 41411	4	-1	-1	2	2	75	20	35	15	40	0	40	40	60	15
2 16 51511	4	-1	-1	-1	-1	65	30	-1	20	-1	-1	-1	-1	-1	45

I HAVE BEEN A SUPERVISOR FOR A FOL SECTION FOR THE PAST YEAR

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA
 GRADE : F-5
 MOS : 13F20
 IN ARMY : 4YR
 IN ARTILLERY : 4YR
 WHEN
 HOW LONG
 MO YR MO YR
 FDC HCO : 78
 FDC COMPUTER : 79
 WHEN
 HOW LONG
 MO YR MO YR
 FDC HCO : 78
 FDC COMPUTER : 79
 WHEN
 HOW LONG
 MO YR MO YR
 FDC HCO : 78
 FDC COMPUTER : 79

*SUPERVISED : 10

CREW TASKS

OPUTHARY TASSIS																		
CREW RESP	SYMP CUM	CON CLIMB	STAIRS	LIFT BOXES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	FDD				FCD			COMPUTER		
									SAY MISN	REVIEW CALC	SAY ORDER	PLOT TGT	ORIENT MDP	READ RANGE	CALC U	SAY SET	2	5
2	20	411111	3	30	60	7	1	4	35	15	7	10	0	10	25	11		
2	20	515031	4	-1	-1	4	1	2	60	15	11	20	10	15	40	18		
2	20	114011	4	35	60	6	1	2	6	11	7	0	0	5	22	11		
2	20	515311	4	-1	-1	-1	-1	2	30	15	13	15	0	13	40	10		
2	20	215111	5	0	0	30	4	7	10	0	0	0	0	0	0	0		
2	20	415111	4	0	0	20	5	8	10	0	0	4	0	7	20	0		
2	20	311111	4	20	20	20	5	4	10	6	4	6	5	0	0	0		
2	20	315111	3	0	0	4	7	8	13	0	0	0	0	0	0	0		
2	20	515223	3	-1	-1	-1	-1	-1	17	-1	-1	0	0	0	0	0		
2	20	414112	3	30	40	-1	-1	-1	11	10	8	12	-1	6	30	6		
2	20	515111	2	-1	-1	-1	-1	-1	9	-1	9	0	0	0	40	9		
2	20	112111	3	0	0	3	10	20	7	0	0	7	0	0	0	0		
2	20	514111	4	20	25	4	4	6	9	0	0	0	0	5	17	50		
2	20	313112	4	20	30	-1	-1	-1	16	0	6	14	0	0	0	0		
2	20	315113	4	-1	-1	-1	-1	-1	13	0	13	14	0	9	19	11		
2	20	513111	4	20	25	2	4	7	9	0	0	6	0	0	0	0		
2	20	123111	3	30	35	7	6	7	0	0	0	0	0	0	0	0		
2	20	34251	3	-1	-1	-1	-1	-1	0	0	0	6	4	4	17	5		
2	20	115111	3	0	0	7	4	9	10	0	-1	0	0	7	20	7		
2	20	521111	4	-1	-1	-1	-1	-1	15	-1	-1	0	0	0	0	0		
2	20	113121	4	20	25	3	3	4	12	0	0	7	4	4	17	4		
2	20	211111	4	-1	-1	7	4	4	9	-1	-1	-1	-1	-1	-1	-1		
2	20	241111	4	20	40	3	3	4	14	-1	-1	7	6	6	20	6		
2	20	415114	4	-1	-1	-1	-1	-1	20	-1	-1	0	5	6	20	6		
2	20	312111	4	0	0	1	2	4	10	-1	-1	0	0	7	20	7		
2	20	314112	3	-1	-1	-1	-1	-1	13	7	7	7	5	7	20	7		
2	20	314113	4	-1	-1	-1	-1	-1	17	13	13	10	6	10	30	7		
2	20	412111	4	20	25	2	3	4	7	0	0	0	0	0	0	0		
2	20	414111	3	30	35	2	2	3	13	11	9	0	5	9	20	9		
2	20	525111	4	-1	-1	-1	-1	-1	15	7	7	10	0	9	30	9		

UPDUTARY TASKS

UNSIMULATED

MUC HCO RUN DIRECTLY FROM CLERK PRIOR TO TAKING OVER FDC SECTION

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

UNCLASSIFIED DATA
 GRADE : 1E-5
 NOS : 113F
 IN ARMY : 113F
 IN ARTILLERY : 113F
 WHEN :
 COMBAT : 20
 ARTIL. CONTRACTIONS : 5
 WHEN :
 #SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	STAIRS	LIFT	CLIMB	WALK	LIFT	BOXES	OPEN	FDC				MCO				COMPUTER			
											SAY	VIEW	SAY	VIEW	PLT	ORIENT	HEAD	RANGE	CALC	SA	SET	SET
USUAL TIME, SEC											2	5	3	1	1	1	3	15	3			
2 21 411111	3	-1	-1	-1	-1	-1	1	30	5	20	8	12	-1	-1	6	7	5	35	4			
2 21 515031	3	-1	-1	-1	-1	-1	1	3	4	12	-1	-1	-1	-1	0	-1	-1	-1	-1	-1	-1	-1
2 21 114111	4	25	30	30	30	30	2	3	4	12	3	0	0	0	0	4	0	20	0	0	0	0
2 21 515111	4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 213111	3	20	25	25	25	25	3	7	11	13	3	7	7	5	6	4	4	20	4	4	4	4
2 21 413111	3	30	30	30	30	30	2	1	5	20	5	0	0	0	10	6	4	22	999	0	0	0
2 21 311111	4	20	25	25	25	25	3	2	10	15	0	0	0	0	0	0	0	0	0	0	0	0
2 21 313111	4	20	25	25	25	25	2	2	6	13	0	0	0	0	0	0	0	0	0	0	0	0
2 21 515223	4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 414112	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 515111	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 112111	4	20	25	25	25	25	5	5	10	13	3	6	0	0	0	4	4	18	4	4	4	4
2 21 514111	4	20	30	30	30	30	-1	2	4	20	5	10	5	5	10	6	5	25	5	5	5	5
2 21 313112	3	20	25	25	25	25	-1	3	15	12	3	0	0	0	6	0	0	20	0	0	0	0
2 21 315113	2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 513111	3	22	24	24	24	24	3	3	6	15	8	11	-1	-1	6	0	0	20	0	0	0	0
2 21 123111	3	25	30	30	30	30	3	4	7	14	4	8	8	5	10	9	5	30	5	5	5	5
2 21 334231	4	999	999	999	999	999	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 113111	4	25	30	30	30	30	-1	3	4	12	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 521111	4	20	25	25	25	25	-1	2	4	20	3	0	0	0	6	4	4	20	0	0	0	0
2 21 113121	3	20	25	25	25	25	3	7	11	13	3	7	5	5	6	4	4	20	4	4	4	4
2 21 211111	3	20	25	25	25	25	3	7	11	13	3	7	5	5	6	4	4	20	4	4	4	4
2 21 224111	3	30	40	40	40	40	2	2	7	15	6	12	0	0	12	10	7	30	7	7	7	7
2 21 415114	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 21 312111	3	20	25	25	25	25	2	3	15	12	3	0	0	0	6	0	0	20	0	0	0	0
2 21 314112	3	25	28	28	28	28	2	2	6	15	0	12	7	7	10	9	5	27	6	6	6	6
2 21 314113	3	25	28	28	28	28	2	1	4	16	8	12	7	7	10	9	5	27	6	6	6	6
2 21 412111	3	25	35	35	35	35	1	24	4	16	7	11	5	5	11	6	4	30	5	5	5	5
2 21 414111	3	-1	-1	-1	-1	-1	1	5	5	20	0	12	6	6	11	7	5	35	6	6	6	6
2 21 523111	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

I HAVE OPEN SECTION CHIEF IN FDC FOR 4 MONTHS AND BEFORE THAT I WAS THE CHIEF COMPUTER

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CRFM

GRAPHIC DATA
 1F-4
 113F20
 IN ARMY : 2YH
 IN ARTILLERY : 2YH
 COMBAT : IN
 ARTIL. COORDIN : 5
 WHEN : 1000 YH
 HOW LONG : 10 YH
 FDC HCU : 1
 FDC COMPUTER : 1
 #SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	LIFT	WALK	LIFT	UPEN	FDC				HCU				COMPUTER			
								WISN	REVIEW	SAY	ORIENT	HEAD	PLOT	ORIENT	HEAD	CALC	SAY	ORIENT	HEAD
USUAL	TIME	SEC	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
2	23	411111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	512431	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	114111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	515311	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	213111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	413111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	311111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	513111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	515221	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	414111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	515111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	112111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	514111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	313112	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	315113	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	515111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	123111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	342311	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	115111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	521111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	115121	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	211111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	415110	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	512111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	314112	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	514113	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	412111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	414111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
2	23	525111	1	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

WORKING IN FDC IN KOREA AND THE USA. USING BOTH THE 19R AND 109R PLOTZERS. I HAVE LATELY BEEN WORKING AS COMPUTER FOR C 2/37 FA DURING FTA'S AND ALSO WAS COMPUTER DURING XH25 SHOKF TEST FOR THE U.S. ARMY FIELD ARTILLERY BOARD.

02ND INCREASE ABOVE USUAL TIME
 -15CANNOT DO IT AT ALL
 99902ND REPLY
 92ND REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA
 GRADE : 1F-4
 MOS : 31310
 IN ARMY : 2YM
 IN ARTILLERY : 2YM
 WHEN : 10/10/10
 MO : 10
 YR : 10
 YR MO : 10
 FDC HCU : 2
 FDC COMPUTER : 6
 COWBAT : 2N
 ANTI-A. COHRTATION : 5
 SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	LIFT	CLIMB	WALK	LIFT	OPEN	FDC				HCU				COMPUTER			
									SAY	REVIEW	SAY	ORDER	PLOT	ORIENT	HEAD	RANGE	CALC	SAY	U	SET
USUAL TIME, SEC	15	20	20	20	20	20	20	20	2	5	3	3	1	1	1	3	15	15	3	3
2 24 411111	4	20	0	4	10	7	10	10	0	7	5	0	0	0	0	0	0	0	0	0
2 24 515831	5	30	90	1	12	2	15	15	10	7	5	12	12	7	7	7	20	5	5	5
2 24 114111	4	17	0	5	12	5	10	10	0	0	0	0	7	4	4	4	17	0	0	0
2 24 515311	4	45	-1	3	5	1	30	30	5	4	0	0	9	0	6	20	20	5	5	5
2 24 213111	4	0	25	5	12	7	10	10	0	0	0	0	0	5	0	0	17	0	0	0
2 24 413111	4	0	25	4	10	6	15	15	5	7	4	4	10	5	5	17	0	0	0	0
2 24 311111	4	0	25	5	15	5	12	12	3	0	0	0	12	6	5	20	5	5	5	5
2 24 313111	4	10	30	4.5	12	5	14	15	3	6	0	0	13	7	5	23	5	5	5	5
2 24 515231	4	-1	-1	-1	3	1	30	30	7	7	5	5	15	12	8	30	7	7	7	7
2 24 414112	4	20	25	5	15	7	12	12	4	0	0	0	0	5	5	20	5	5	5	5
2 24 535111	4	-1	-1	5	5	1	30	30	5	7	5	5	15	7	7	27	5	5	5	5
2 24 112111	4	17	23	6	17	7	10	13	0	6	0	0	7	5	4	0	0	0	0	0
2 24 514111	4	25	25	4	11	5	13	13	4	7	4	4	10	5	0	17	0	0	0	0
2 24 313112	4	30	30	5	12	5	17	17	5	7	4	4	7	4	4	17	4	4	4	4
2 24 315113	4	40	-1	1	5	3	25	25	6	8	6	6	12	10	6	30	6	6	6	6
2 24 513111	4	25	30	3	8	5	17	17	4	0	0	0	9	5	5	17	5	5	5	5
2 24 123111	4	20	25	6	15	6	12	12	4	7	5	5	7	5	5	17	5	5	5	5
2 24 334231	4	40	-1	3	7	3	21	21	7	10	7	7	14	7	7	30	7	7	7	7
2 24 113111	4	17	23	5	14	6	11	11	3	6	4	4	7	5	4	17	4	4	4	4
2 24 521111	4	20	27	5	13	0	12	12	4	0	0	0	7	4	4	17	4	4	4	4
2 24 113121	4	20	25	5	10	6	15	15	3	6	0	0	7	4	4	17	4	4	4	4
2 24 211111	4	30	21	5	12	5	15	15	3	4	0	0	8	5	0	18	0	0	0	0
2 24 224111	4	25	27	4	12	5	17	17	4	4	0	0	9	5	5	18	5	5	5	5
2 24 415314	4	-1	-1	1	8	2	20	20	7	10	7	7	15	10	0	30	7	7	7	7
2 24 312111	4	26	25	1	10	6	12	12	4	6	0	0	7	4	0	17	4	4	4	4
2 24 314112	4	30	35	4	10	4	15	15	4	7	4	4	10	5	4	22	5	5	5	5
2 24 314113	4	-1	-1	1	4	1	25	25	5	9	7	7	15	7	7	30	7	7	7	7
2 24 413111	4	17	23	4	12	6	17	17	3	6	0	0	7	4	4	19	4	4	4	4
2 24 414111	4	25	30	4	10	0	13	13	4	6	0	0	8	6	0	17	4	4	4	4
2 24 525111	4	-1	-1	1	5	2	15	15	3	9	5	5	12	6	5	22	6	6	6	6

I WORKED IN AN FDC SECTION UNTIL I RECEIVED A PROMOTION. PROFILE, KEEPING ME FROM GOING TO THE FIELD. NOW I AM WORKING AS CLERK/ TYPIST IN THE S-3 SECTION.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

PIPE DIRECTION CENTER CHEM

GRAPHIC DATA WHEN HOW LONG
 IF-A FDC HCU YN YN
 11510 110 A1
 FDC COMPUTER : 1 92 A
 IN ARMY : 2YH 110
 IN ARTILLERY : 2YH 1
 WHEN
 CUMBAT IN
 ARTIL. COMBATIN
 4510FHVHVED : 5

CHEM TASKS

ORDINARY TASKS

CHEW RESP	SYMP COMP	CUM CLIMB STAIRS	LIFT MULES STAIRS	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	FNU			HCU			COMPUTER				
								SAY MISH	VIEW CALC	REVIEW ORDEN	PLT TGT	ORIENT NDP	READ RANGE	CALC DO	SAY SET	USUAL TIME, SEC	15	20
UNSTIPULATED														1	1			
2 25 41111	4	25	1	1	2	1	4	0	0	0	7	7	5			0	0	0
2 25 51523	4	-1	-1	1	-1	-1	10	10	0	0	4	4	5	25	5	5	6	
2 25 11411	5	-1	1	1	1	1	7	6	0	0	10	10	4	0	0	0	5	
2 25 51531	5	25	1	1	1	1	5	4	4	4	4	4	5	0	0	0	7	
2 25 21311	5	-1	1	1	1	2	10	7	0	0	6	6	5	20	5	0	0	
2 25 41311	5	25	2	2	2	2	10	0	0	0	0	0	0	0	0	0	5	
2 25 31111	5	20	2	2	2	2	10	0	0	0	0	0	0	0	0	0	4	
2 25 31311	5	-1	1	-1	-1	-1	15	7	4	15	4	4	0	0	12	0	10	
2 25 51523	5	-1	-1	-1	-1	-1	20	25	15	15	-1	-1	-1	30	-1	15	15	
2 25 41412	5	20	2	2	2	3	4	6	20	5	0	0	5	0	0	0	0	
2 25 51511	5	-1	-1	-1	-1	-1	15	4	0	0	0	0	0	0	0	0	4	
2 25 11211	0	0	2	2	2	5	10	0	0	0	0	0	0	0	0	0	10	
2 25 51411	4	21	1	1	1	5	10	4	4	4	4	4	0	0	0	0	15	
2 25 31311	5	-1	-1	-1	-1	-1	20	4	4	4	0	0	6	21	0	0	4	
2 25 51511	5	-1	-1	-1	-1	-1	20	-1	25	20	-1	10	4	30	10	5	5	
2 25 51511	5	21	1	1	1	3	15	6	5	5	0	4	4	0	0	0	7	
2 25 12311	5	22	1	1	2	3	10	0	0	0	0	0	0	10	0	0	5	
2 25 31423	5	-1	-1	-1	-1	-1	25	20	-1	-1	10	10	-1	18	10	0	0	
2 25 11311	5	20	2	2	2	3	10	0	0	0	6	6	0	25	0	0	10	
2 25 52111	5	20	2	2	2	3	11	6	4	4	6	6	5	0	0	0	0	
2 25 11312	5	21	2	2	2	3	11	4	4	4	6	6	6	18	0	0	4	
2 25 21111	5	20	2	2	2	3	12	4	4	4	0	0	5	10	0	0	5	
2 25 22411	0	22	1	1	1	3	16	9	5	5	10	0	0	20	6	10	6	
2 25 41514	3	-1	-1	-1	-1	-1	35	-1	-1	-1	-1	-1	-1	40	-1	-1	-1	
2 25 31211	3	10	2	2	2	2	10	4	5	5	0	5	5	20	5	5	5	
2 25 31411	2	22	1	1	1	2	10	6	6	5	6	6	5	20	5	5	5	
2 25 31411	3	22	2	2	2	3	15	-1	-1	-1	10	7	16	25	0	0	0	
2 25 41211	5	21	2	2	2	3	15	0	5	5	9	0	5	0	0	0	5	
2 25 41411	5	21	2	2	2	3	15	0	6	6	10	5	5	0	0	0	5	
2 25 52511	0	16	1	1	1	3	16	0	0	5	10	6	6	20	5	5	5	

FDC CHEM/SIP HCU/A & R HCU AND CUC HCU. MY TIME IS SPENT IN ONE OF THESE AREA'S ALMOST ALL OF THE TIME! * 6-8 MONTHS

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DEMOGRAPHIC DATA
 GRADE 2F-7
 MOS 315044
 IN ARMY 315044
 IN ARTILLERY 315044
 WHEN 75 5
 HOW LONG 75 5
 WHEN 75 5
 SUPERVISED 3250

CREW TASKS

ORDINARY TASKS

CREW RESP	SYMP COMP	LOW CLIMB STAIRS	LIFT BOXES STAIRS	LIFT CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	FNU				MCO				COMPUTER			
								SAY MISN	REVIEW CALC	SAY URDFM	PLOT TGT	ORIENT MDP	HEAD RANGE	CALC U Q	SAY SET	SAY SET			
USUAL TIME, SEC								2	5	5	1	1	3	15	15	3			
2 28 411111	0	0	0	0	20	10	10	0	0	0	0	0	0	0	0	0			
2 28 515031	-1	0	0	0	5	3	10	0	0	0	0	0	0	0	0	0			
2 28 114111	20	0	0	0	10	0	10	0	0	0	0	0	0	0	0	0			
2 28 515011	120	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0			
2 28 213111	0	0	0	0	30	10	0	0	0	0	0	0	0	0	0	0			
2 28 413111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2 28 311111	0	0	0	0	35	15	0	0	0	0	0	0	0	0	0	0			
2 28 515011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2 28 313111	0	0	0	0	30	10	0	0	0	0	0	0	0	0	0	0			
2 28 515221	-1	0	0	0	10	2	15	0	0	0	0	0	0	0	0	0			
2 28 414112	25	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0			
2 28 515011	60	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0			
2 28 112111	0	0	0	0	35	15	0	0	0	0	0	0	0	0	0	0			
2 28 514111	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0			
2 28 313112	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0			
2 28 313113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2 28 513111	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0			
2 28 123111	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0			
2 28 334231	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0			
2 28 113111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2 28 521111	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0			
2 28 113121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2 28 211111	0	0	0	0	40	10	0	0	0	0	0	0	0	0	0	0			
2 28 224111	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0			
2 28 415112	300	0	0	0	5	3	15	0	0	0	0	0	0	0	0	0			
2 28 312111	0	0	0	0	25	10	0	0	0	0	0	0	0	0	0	0			
2 28 314112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
2 28 514112	-1	0	0	0	5	2	10	0	0	0	0	0	0	0	0	0			
2 28 412111	25	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0			
2 28 414111	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0			
2 28 523111	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0			

RESPONSIBLE FOR THE SUPERVISION, TRAINING AND THE FUNCTION OF THE FDC

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

DETAILED DATA WHEN HOW LONG
 NO YR YR H0
 1
 FDC HCU
 FDC COMPUTER :
 IF-5
 :13F
 IN APHY : 3YR
 IN APITLPEY : 3YR
 WHEN
 COMBAT :
 ARTILL. COMBAT : 5
 SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	COMP	CON	CLIMB	STAIRS	LIFT	BOXES	WALK	LIFT	OPEN	FDC				HCU				COMPUTER			
										SAY	REVIEW	SAY	WISN	PLT	ORIENT	READ	CALC	SAY	U	U	SET
USUAL TIME, SEC	15	20	4	45	10	5	CONFIDENCE	4		2	5	3	1	1	1	3	15	3			
2 35 525111	70	-1	1	5	2	10				10	12	10	10	15	7	7	25	10			
2 35 414111	30	40	2	10	4	7				5	8	5	5	8	5	5	20	5			
2 35 412111	20	30	3	20	7	7				5	7	4	5	7	5	0	10	5			
2 35 314111	20	60	1	5	2	10				10	30	10	10	15	10	10	25	10			
2 35 314112	20	-1	1	5	2	10				10	15	10	10	20	15	15	30	10			
2 35 312111	20	40	3	30	7	6				5	7	5	5	0	0	5	0	5			
2 35 415111	20	-1	1	2	-1	15				19	20	10	10	20	15	20	40	10			
2 35 224111	20	60	1	5	3	6				3	8	5	5	6	5	0	0	4			
2 35 211111	20	30	2	20	6	5				4	8	4	4	0	0	0	0	5			
2 35 113111	20	30	3	30	6	5				0	0	0	0	0	0	0	0	0			
2 35 123111	20	30	3	30	5	5				0	0	0	0	0	0	0	0	0			
2 35 352231	20	45	1	5	2	7				6	10	6	6	10	7	7	20	5			
2 35 115111	20	25	3	30	4	5				0	0	0	0	0	0	0	0	0			
2 35 521111	20	40	2	15	3	7				5	0	5	5	0	0	5	0	5			
2 35 513111	20	35	2	15	4	6				5	10	5	5	10	5	5	20	5			
2 35 313112	20	-1	-1	5	-1	10				8	12	8	8	15	10	8	25	8			
2 35 514111	20	40	2	15	3	5				5	0	5	5	0	0	5	0	5			
2 35 112111	20	-1	1	5	2	7				7	10	7	7	10	5	7	20	7			
2 35 535111	20	25	3	35	8	5				0	0	0	0	0	0	0	0	0			
2 35 414112	20	-1	-1	2	-1	10				10	15	10	10	20	15	10	25	10			
2 35 515223	20	50	1	5	2	7				5	7	5	5	7	5	5	20	5			
2 35 313111	20	-1	1	-1	-1	6				8	10	8	8	10	7	8	30	8			
2 35 311111	20	30	3	30	7	5				5	0	5	5	0	0	5	0	5			
2 35 413111	20	40	3	15	4	6				5	7	5	5	8	5	5	30	5			
2 35 413111	20	30	3	15	4	6				5	7	5	5	8	5	5	30	5			
2 35 515111	20	-1	-1	-1	-1	10				5	6	4	4	6	0	4	20	4			
2 35 114111	20	50	1	4	-1	5				0	6	0	0	7	0	0	20	0			
2 35 515431	20	-1	1	5	7	7				6	10	6	6	10	8	8	40	8			
2 35 411111	20	20	3	35	6	5				0	0	0	0	0	0	0	0	0			

CHART OPERATION TRUMP OVER SEVER WHEN CHIFF IS NOT AROUND

GRADE : E-5
 MOS : 13F20
 IN ARMY : 4YR
 IN ARTILLERY : 4YR
 WHEN
 COMBAT : 3M
 ANTL. COMPAT :
 WHEN
 #SUPERVISED : 5

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 0=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

CREW TASKS

CREW	SYM	CON	CLIMB	STAIRS	LIFT	WALK	UPEN	FDU			MCD			COMPUTER		
								SAY	REVIEW	SAY	PLOT	ORIENT	READ	CALC	SAY	
USUAL	TIME	SFL	15	20	2	30	10	2	5	3	1	1	3	15	3	
2 36 525111	3	40	120	2	25	6	9	10	30	12	15	9	14	45	25	
2 36 414111	3	50	130	1	15	4	12	11	35	14	10	12	15	50	30	
2 36 414113	3	40	100	2	20	6	10	18	30	18	20	10	10	40	20	
2 36 314112	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 312111	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 415314	3	100	150	1	3	1	25	14	50	20	-1	-1	-1	-1	40	
2 36 224111	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 211111	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 113121	3	30	63	2	35	8	9	6	20	7	17	10	13	32	12	
2 36 123111	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 334231	3	65	140	1	7	2	15	15	45	25	25	20	20	65	35	
2 36 113111	3	20	25	2	30	8	6	3	10	6	8	5	5	20	5	
2 36 521111	3	30	100	2	24	9	6	9	9	6	10	12	12	30	20	
2 36 513111	3	20	75	2	30	9	6	8	8	5	8	11	10	20	15	
2 36 315111	3	40	120	2	25	6	9	10	30	12	15	9	14	45	25	
2 36 314112	3	20	30	2	24	6	6	4	8	5	10	5	6	20	6	
2 36 514111	3	30	30	1	24	6	6	8	12	6	12	6	10	30	9	
2 36 112111	3	10	25	2	30	9	6	8	6	0	7	4	5	20	5	
2 36 535111	3	40	120	2	25	6	6	10	30	12	15	9	14	45	25	
2 36 414112	3	30	30	1	24	6	6	8	12	6	12	6	10	30	9	
2 36 515223	3	40	120	2	25	6	6	10	30	12	15	9	14	45	25	
2 36 313111	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 311111	3	30	60	2	30	10	7	4	15	5	15	9	12	30	10	
2 36 413111	3	60	60	2	35	9	7	5	10	9	10	6	6	20	10	
2 36 213111	3	40	60	2	35	9	7	4	10	5	7	5	7	25	6	
2 36 515311	3	40	60	2	30	9	7	4	10	5	7	5	7	25	6	
2 36 114111	3	40	125	1	24	8	7	4	10	6	10	6	6	40	7	
2 36 515431	3	-1	-1	-1	40	3	3	8	10	5	-1	-1	-1	30	6	
2 36 411111	3	30	30	2	24	9	9	3	7	5	8	5	6	20	6	

CONFIDENCE: 4

ORDINARY TASKS

0200 INCREASE ABOVE USUAL TIME
 -1ECANNOI DO IT AT ALL
 9990END REPLY
 92NU REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEPARTMENTAL DATA WHEN HOW LONG
 GRADE SF-6 TANK COMMANDER 71 11
 MOS 1195P GUNNER : 0 0
 IN ARMY 115YR 10MO LOADER : 70
 IN ARTILLERY 115YR 10 DRIVER : 70
 COMBAT IN WHEN
 ARTIL. COMBATIN #SUPERVISED 3250

CREW TASKS

ORDINARY TASKS

CREW RSP	SYMP COMP	CON STAIRS	CLIMB MOVES	WALK	LIFT BOXES	UPEN LOCK	ISSUE		TANK COMMANDER			GUNNER			LOADER			DR	
							FIRE CMD	ARM	RANGE	DEF LAY	ISSUE SUBSO CMD	IDENT IGY	AIM FIRE	APPLY CORR	ARM	LOAD ARM			
UNSTIPULATED																			
3	5	41111	5	-1	-1	30	0	10	10	3	1	6	7	1	5	4			
3	5	51523	5	-1	-1	30	30	10	15	10	5	0	10	5	10	10	10		
3	5	11411	5	-1	-1	30	5	10	10	30	15	10	10	30	30	10	15		
3	5	51531	5	-1	-1	-1	10	10	10	15	5	10	10	10	15	10	10		
3	5	21311	5	-1	-1	40	0	10	0	6	3	10	0	3	10	10	10		
3	5	41311	5	-1	-1	50	5	0	10	10	5	0	0	5	10	10	10		
3	5	31111	5	-1	-1	30	5	10	10	10	5	10	15	5	10	10	10		
3	5	51523	5	-1	-1	-1	15	25	15	25	5	20	15	-1	5	10	10		
3	5	41412	5	-1	-1	30	10	10	10	15	10	10	10	5	15	10	10		
3	5	31311	5	-1	-1	-1	10	30	10	30	10	15	15	-1	5	15	10		
3	5	51511	5	50	12	4	0	0	0	0	0	0	0	5	10	10	10		
3	5	51411	5	-1	-1	50	10	15	15	15	10	15	20	-1	-1	15	15		
3	5	31511	5	-1	-1	50	-1	15	10	15	5	15	15	-1	-1	15	15		
3	5	51311	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
3	5	51311	5	-1	-1	40	10	15	10	15	10	10	15	10	15	10	10		
3	5	12311	5	-1	-1	30	10	30	10	10	5	15	15	10	15	10	10		
3	5	33423	5	-1	-1	50	30	30	30	30	15	20	20	15	30	15	15		
3	5	11311	5	70	40	30	5	0	10	0	5	10	10	5	10	0	0		
3	5	52111	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
3	5	11312	5	70	60	20	0	0	0	0	0	0	0	5	0	0	0		
3	5	21111	5	-1	-1	30	5	10	6	6	5	12	14	5	10	10	10		
3	5	22411	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
3	5	41536	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
3	5	31211	5	-1	-1	40	5	10	10	10	5	12	15	5	10	10	10		
3	5	51411	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
3	5	51411	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		
3	5	41211	5	-1	-1	40	10	15	10	10	5	15	15	10	20	10	10		
3	5	41411	5	-1	-1	60	15	25	15	25	15	20	20	-1	-1	15	15		
3	5	52511	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1		

MBU TANK CREW

GRADE		OPEN		HOW LONG	
MO	YR	MO	YR	MO	YR
INFANTRY	1	7	3		
IN ARTILLERY	2	7	3		
IN ARMY	3	7	3		
IN INFANTRY	4	7	3		
IN ARTILLERY	5	7	3		
IN ARMY	6	7	3		
IN INFANTRY	7	7	3		
IN ARTILLERY	8	7	3		
IN ARMY	9	7	3		
IN INFANTRY	10	7	3		
IN ARTILLERY	11	7	3		
IN ARMY	12	7	3		
IN INFANTRY	13	7	3		
IN ARTILLERY	14	7	3		
IN ARMY	15	7	3		
IN INFANTRY	16	7	3		
IN ARTILLERY	17	7	3		
IN ARMY	18	7	3		
IN INFANTRY	19	7	3		
IN ARTILLERY	20	7	3		
IN ARMY	21	7	3		
IN INFANTRY	22	7	3		
IN ARTILLERY	23	7	3		
IN ARMY	24	7	3		
IN INFANTRY	25	7	3		
IN ARTILLERY	26	7	3		
IN ARMY	27	7	3		
IN INFANTRY	28	7	3		
IN ARTILLERY	29	7	3		
IN ARMY	30	7	3		
IN INFANTRY	31	7	3		
IN ARTILLERY	32	7	3		
IN ARMY	33	7	3		
IN INFANTRY	34	7	3		
IN ARTILLERY	35	7	3		
IN ARMY	36	7	3		
IN INFANTRY	37	7	3		
IN ARTILLERY	38	7	3		
IN ARMY	39	7	3		
IN INFANTRY	40	7	3		
IN ARTILLERY	41	7	3		
IN ARMY	42	7	3		
IN INFANTRY	43	7	3		
IN ARTILLERY	44	7	3		
IN ARMY	45	7	3		
IN INFANTRY	46	7	3		
IN ARTILLERY	47	7	3		
IN ARMY	48	7	3		
IN INFANTRY	49	7	3		
IN ARTILLERY	50	7	3		
IN ARMY	51	7	3		
IN INFANTRY	52	7	3		
IN ARTILLERY	53	7	3		
IN ARMY	54	7	3		
IN INFANTRY	55	7	3		
IN ARTILLERY	56	7	3		
IN ARMY	57	7	3		
IN INFANTRY	58	7	3		
IN ARTILLERY	59	7	3		
IN ARMY	60	7	3		
IN INFANTRY	61	7	3		
IN ARTILLERY	62	7	3		
IN ARMY	63	7	3		
IN INFANTRY	64	7	3		
IN ARTILLERY	65	7	3		
IN ARMY	66	7	3		
IN INFANTRY	67	7	3		
IN ARTILLERY	68	7	3		
IN ARMY	69	7	3		
IN INFANTRY	70	7	3		
IN ARTILLERY	71	7	3		
IN ARMY	72	7	3		
IN INFANTRY	73	7	3		
IN ARTILLERY	74	7	3		
IN ARMY	75	7	3		
IN INFANTRY	76	7	3		
IN ARTILLERY	77	7	3		
IN ARMY	78	7	3		
IN INFANTRY	79	7	3		
IN ARTILLERY	80	7	3		
IN ARMY	81	7	3		
IN INFANTRY	82	7	3		
IN ARTILLERY					

NSA: USIA/AFRIC

CREW TASKS

PRIMARY TASKS

[illegible]

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE :F-7 TANK COMMANDER 70 6
 MUR :19F4YR GUNNER 75 1
 IN ARMY :13YR LOADER :
 IN ARTILLERY : YR DRIVER :
 COMBAT : YR WHEN
 ARTIL. COMBAT :
 SUPERVISOR :250

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	LIFT	WALK	LIFT	UPLM	ISSUE	TANK COMMANDER				GUNNER				LOADER		DM			
									CLIMB	STAIRS	MOVER	BOXES	ISSUE	RANGE	UEP	ISSUE	IDENT	AIM		FIRE	APPLY	CURH
RESP	COMP	CLIMB	STAIRS	MOVER	STAIRS	MOVER	STAIRS	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO		
USUAL TIME, SEC	15	20	UNSATURATED										1	5	3	4	1	6	7	1	5	4
3 0 411111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 515231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 114111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 515711	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 213111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 413111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 311111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 313111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 515221	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 414112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 535111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 112111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 514111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 515112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 515113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 515111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 123111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 334231	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 113111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 521111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 113121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 211111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 415714	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 312111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 314112	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 314113	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 412111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 414111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3 0 525111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

TANK CMDR, SUPERVISOR OF 3-20 PEOPLE AND LOOK OVER AS PLT SERGEANT

M60 TANK CREW

DEFENSE DATA		WHEN	HOW LONG
		MO YR	YR MO
GRADE	TANK COMMANDER	10	3
MOS	PILOT	77	2
IN ARMY	LOADER	76	1
IN ARTILLERY	DRIVER	75	1

00 : U351A1Jdl15#

ARTIL. COMBAT: N

CREW TASKS

OPTIONAL TASKS

REFSP	NEW	SYMP	ON	CLIMB	STAIRS	LTFT	CLIMB	STAIRS	WALK	LIFT	UPEN	LOCK	BANK COMMANDER				GUNNER				LOADER				OR
													ISSUE	RANGE	DEP	ISSUE	IDENT	AIM	APPLY	ARM	LOAD	ARM	STOP		
													ISSUE	RANGE	DEP	ISSUE	IDENT	AIM	APPLY	ARM	LOAD	ARM			
													CMD			CMD	161	FIRE	CORR						
20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15	20	15		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135	140		
25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135			

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=END REPLY
 9=END REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA
 GRADE : E-6
 MOS : 314F30
 IN ARMY : 10YR
 IN ARTILLERY : 10YR
 WHEN :
 MO YR
 TANK COMMANDER : 77 5
 GUNNER : 75 1
 LOADER : 73 2
 DRIVER : 73 2
 COMBAT : IN
 ARTILL. COMPAT: M
 #SUPERVISOR : 350

CREW TASKS

ORDINARY TASKS

CREW RESP	SYMP COMP	CON CLIMB STAIRS	LTFT CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	TANK COMMANDER										GUNNER				LOADER		DR															
							ISSUE FIRE CMD	RANGF	UEP LAY	ISSUE SURSO CMD	IDENT TGT	AIM FIRE	APPLY CURR	ARM LOAD	ARM	STOP																						
USUAL TIME, JFC																		15	20	INTERPOLATED										1	5	3	4	6	7	1	5	4
3 11 41111	3	0	0	4	10	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 51503	3	-1	-1	1	1	2	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 11411	3	20	30	1	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 51531	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 21311	3	0	0	3	10	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 41311	3	0	0	3	5	5	30	3	7	4	3	8	9	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 31311	3	25	35	2	5	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 31311	3	20	30	3	5	4	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 51523	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 41412	3	0	0	3	5	5	30	4	7	6	3	8	10	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 53511	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 11211	3	20	30	3	5	3	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 51411	3	20	30	3	5	3	30	3	7	5	3	8	9	3	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 31312	3	25	35	1	3	2	30	3	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 31513	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 51311	3	25	30	2	3	2	30	2	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 12311	3	0	0	3	10	5	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 33423	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 11311	3	0	0	5	10	3	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 52111	3	25	30	3	5	3	30	3	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 11312	3	0	0	2	3	2	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 21111	3	0	0	3	5	3	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 22411	3	25	30	3	5	3	30	3	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 41531	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 31211	3	25	30	3	5	3	30	3	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 31412	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1							
3 11 31413	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						
3 11 41211	3	25	30	3	5	3	30	3	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 41411	3	25	30	3	5	3	30	3	7	5	3	8	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
3 11 52311	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1						

FAV. TANK SECTION SGT., TANK COMMANDER

MBN TANK CREW

DEPENDENT DATA		MEMO	NOV LUNG
		MO YR	YR MO
GRADE	SF-6	TASK COMPLETER	6
MOS	19FS0	GUNNER	1
IN ARMY	10YR	LOADER	1
IN ARTILLERY	10YR	DRIVER	2

UNCLASSIFIED : 50

CREW TASKS

[illegible]

TANK PLI SCI/ MASTER GROUP FOR AN APPROX TANK UNIT

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

NOO TANK CREW

OFFICER/PHIL DATA WHEN HOW LONG
 GRADE : F-4 TANK COMMANDER 77 6
 MOS : 19FSC3 GUNNER : 76 1
 IN ARMY : 9YR LOADER : 74 1
 IN ARTILLERY : 9YR DRIVER : 75 1
 COMBAT IN WHEN
 ARTIL. COMPATIN #SUPERVISED : 250

CREW TASKS

UPUTARY TASKS

CREW RESP	SYMP COMP	CON CLIMB STAIRS	LIFT FORES STAIRS	CLIMB STAIRS	WALK	LIFT BOATS	OPEN LOCK	TANK COMMANDER				GUNNER				LOADER		DR
								ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SUBGO CMD	IDENT	AIM FIRE	APPLY CORR	ARM	LOAD ARM		
USUAL TIME, SEC																		
15	20	UNSTIPULATED																
3 14 41111 0	30	40	2	15	5	60	3	10	5	3	4	1	6	7	1	5	4	
3 14 51503 0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 11411 0	45	60	1	15	3	10	5	10	8	8	8	5	12	14	5	15	12	
3 14 51571 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 21311 0	45	60	1	15	5	60	3	15	12	16	16	5	12	14	7	15	12	
3 14 41311 0	25	30	2	20	7	45	3	7	5	7	7	3	8	9	3	10	8	
3 14 31111 0	20	40	3	30	10	40	3	10	5	5	5	10	10	10	3	8	8	
3 14 31311 0	20	25	2	25	7	60	2	7	6	8	8	3	8	9	3	7	8	
3 14 51523 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 41412 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 52511 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 11211 0	30	40	3	25	8	50	3	8	7	9	9	3	8	9	3	10	12	
3 14 51411 0	20	50	3	30	10	45	3	10	6	8	8	3	8	10	3	8	8	
3 14 31312 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 31511 0	30	60	2	10	5	60	3	10	6	8	8	3	8	9	3	10	12	
3 14 51311 0	30	40	2	20	5	50	3	10	9	12	12	3	12	14	3	10	12	
3 14 12311 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 31423 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 11311 0	20	30	3	25	7	45	3	10	9	12	12	3	12	14	3	10	8	
3 14 52111 0	20	40	3	30	10	45	3	10	5	5	5	10	10	10	3	6	8	
3 14 11312 0	45	60	1	15	3	60	4	10	9	12	12	3	10	14	3	10	8	
3 14 21111 0	30	50	2	20	5	50	3	10	9	12	12	3	12	14	3	15	12	
3 14 22411 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 41511 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 31211 0	30	45	2	20	5	45	3	15	9	12	12	3	12	14	3	10	12	
3 14 31412 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 31413 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 14 41211 0	45	60	2	15	3	60	3	15	9	12	12	3	12	14	3	15	12	
3 14 41411 0	40	60	2	15	3	60	4	20	12	16	16	4	18	21	4	15	12	
3 14 52511 0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	

TANK PI 1 SCI AND MASTER GUNNER FOR MY COMPANY

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEPARTMENTAL DATA
 GRADE : IF-6
 MOS : 114F30
 IN ARMY : 04N 44N
 IN APTELLEY : 04N 4
 WHEN : 74 1
 COMBAT : 04N
 ARTIL. COMBAT : 04N
 SUPERVISED : 50

CREW TASKS

CREW	SYMP	CON	CLIMB	LTFT	CLIMB	WALK	LIFT	UPEN	TANK COMMANDER				GUNNER				LOADER		DR
									ISSUE	RANGE	UEP	ISSUE	IDENT	AIM	APPLY	ARM	LOAD	STOP	
RFSP	USUAL TIME, SEC	15	20	20	20	20	20	20	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO	CMO
15 41111	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 51503	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 11411	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 51511	25	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 21311	25	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 41311	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31111	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31311	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 51523	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 41412	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 51511	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 11211	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 51411	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31312	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31511	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 51311	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 12311	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31423	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 11311	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 52111	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 11312	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 22411	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 41511	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31211	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31412	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 31411	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 41211	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 41411	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0
15 52511	20	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0

PLT SGT, SECTION JGT TANK COMMANDER

02PM INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE :F-6 TANK COMMANDER 40 YR YR MO
 MOS :19F GUNNER 74 1
 IN ARMY : 3 74 1
 IN ARTILLERY : 3
 DRIVER
 WHEN
 COMBAT :N
 ANTL. CONCENTR :N
 #SUPERVISED : 20

CREW TASKS

UPDINARY TASKS													TANK COMMANDER										GUNNER			LOADER			DR			
CHEN RESP	SYMP COMP	CON STAT'S	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	ISSUE		RANGE		DEP		ISSUE		IDENT	GUNNER			ARM	LOAD	STOP											
							FIRE	CMD	ISSUE	CMD	LAY	SUB-SON	16T	AIM		APPLY	CORN															
USUAL TIME:SEC																							1	5	3	4	1	6	7	1	5	4
3 17 411111	2	17	25	20	20	7	5	10	4	8	5	12	14	3	0	7	5	4	7	8	7											
3 17 515031	3	30	40	-1	15	20	10	15	7	8	6	12	14	0	10	0	0	0	0	0	0											
3 17 114111	3	0	0	3	-1	3	2	0	0	0	2	12	14	3	10	0	0	0	0	0	0											
3 17 515311	2	40	-1	3	5	5	5	15	12	0	3	12	14	0	0	0	0	0	0	0	0											
3 17 213111	2	25	30	25	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 413111	2	17	21	25	10	2	0	0	0	0	2	0	0	2	7	9	2	7	6	6	6											
3 17 311111	3	0	0	20	10	2	2	0	0	0	2	0	0	2	0	0	0	0	0	0	0											
3 17 313111	2	0	-1	3	10	2	2	0	0	0	2	0	0	2	0	0	0	0	0	0	0											
3 17 515223	2	-1	-1	3	-1	6	5	15	10	6	5	12	14	5	-1	0	0	0	0	0	0											
3 17 414112	2	20	30	2	-1	6	5	10	6	-1	5	12	14	2	10	0	0	0	0	0	0											
3 17 515111	2	-1	-1	2	-1	6	5	10	-1	0	5	12	14	5	-1	0	0	0	0	0	0											
3 17 112111	3	0	0	30	10	3	0	7	5	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 514111	2	17	21	10	5	3	3	0	0	0	3	7	8	0	0	0	0	0	0	0	0											
3 17 313112	2	0	0	25	10	3	2	0	0	0	2	0	0	2	0	0	0	0	0	0	0											
3 17 315113	2	-1	-1	15	-1	3	2	6	0	0	2	7	8	2	10	0	0	0	0	0	0											
3 17 513111	2	10	23	15	5	3	2	0	0	0	2	9	10	0	0	0	0	0	0	0	0											
3 17 123111	2	0	0	10	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 334231	2	-1	-1	10	-1	10	-1	15	-1	0	3	18	21	3	0	0	-1	0	0	0	0											
3 17 113111	2	0	0	10	-1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 521111	2	30	45	15	-1	3	0	0	0	0	0	7	10	0	0	0	0	0	0	0	0											
3 17 113121	4	0	0	25	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 211111	3	0	0	10	7	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 224111	2	17	22	5	12	3	3	7	5	0	3	0	0	3	7	9	15	6	6	6	6											
3 17 415310	2	3	45	2	-1	6	5	10	0	0	5	12	15	5	10	0	0	0	0	0	0											
3 17 312111	2	0	0	15	6	3	0	0	0	0	5	0	0	3	0	0	0	0	0	0	0											
3 17 314112	2	30	35	5	2	6	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 314113	2	-1	-1	15	-1	6	0	12	15	0	0	12	15	0	0	0	-1	7	7	7	7											
3 17 412111	2	0	0	25	1	2	0	0	0	0	0	12	15	0	0	0	0	0	0	0	0											
3 17 414111	2	30	40	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
3 17 525111	1	-1	-1	-1	-1	4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1											

INSTRUCTION AT AN MCO ACADEMY. INSTRUCT BASIC NON COMMISSIONED OFFICERS COURSE 19ECMF.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

OPERATIONAL DATA WHEN HUM LONG
 GRAF IF-7 TANK COMMANDER MO YK YK IN
 405 3194H 5 6
 IN ARMY 3137K 2
 IN ARTILLERY 3171K 2
 WHEN
 COMBAT BY 50 ON
 ANTL. CONTRAT SUPERVISED : 50

CREW TASKS

ORDINARY TASKS

CREW REFS	SYMP CUMP	CON CLIMB STAIRS	LIFT MOVES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	TANK COMMANDER				GUNNER				LOADER		DR
								ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SURSO CMD	IDENT TGT	AIM FIRE	APPLY CURR	ARM	LOAD ARM		
		15	20	UNSTIMULATED				1	5	3	4	1	6	7	1	5	4	
3 18 41111 4	25	30	30	2	15	10	30	6	10	10	9	5	8	11	4	0	5	
3 18 515031 5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 114111 5	18	23	25	4	15	12	25	3	7	5	6	3	8	9	3	7	6	
3 18 515311 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 213111 4	23	27	23	3	16	14	23	6	10	8	9	5	10	11	5	10	5	
3 18 413111 9	17	22	25	3	14	13	25	4	7	4	6	2	7	9	0	7	0	
3 18 313111 4	16	21	20	3	14	15	20	2	6	4	5	2	7	6	0	6	0	
3 18 313111 5	0	0	20	3	14	15	20	0	0	0	0	0	0	0	0	0	0	
3 18 515223 0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 414112 4	21	26	26	3	15	12	26	5	10	8	9	2	10	11	0	7	0	
3 18 515111 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 112111 4	0	0	20	3	14	15	20	0	0	0	0	0	0	0	0	0	0	
3 18 514111 4	20	25	25	3	15	10	25	4	9	7	8	0	9	10	0	7	0	
3 18 313112 4	20	24	23	3	15	13	23	5	8	6	7	0	9	10	0	7	0	
3 18 515112 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 513111 4	16	23	22	3	17	14	22	3	4	6	7	0	9	10	0	8	0	
3 18 314231 4	0	0	20	3	14	15	20	0	0	0	0	0	0	0	0	0	0	
3 18 113111 4	0	0	20	3	14	15	20	5	9	6	9	0	11	12	0	7	0	
3 18 521111 4	16	21	20	3	14	12	22	4	9	7	8	0	9	10	0	6	0	
3 16 113121 4	0	0	20	3	14	13	20	0	0	0	0	0	0	0	0	0	0	
3 18 213111 4	19	24	23	3	14	15	23	4	9	7	8	0	10	11	0	7	0	
3 18 415312 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 312111 4	0	0	20	3	14	15	20	0	0	0	0	0	0	0	0	0	0	
3 18 514112 4	16	23	23	3	17	12	23	3	8	6	7	0	9	10	0	7	0	
3 18 314112 4	0	0	20	3	14	15	20	0	0	0	0	0	0	0	0	0	0	
3 18 514112 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	
3 18 412111 4	17	22	23	3	17	14	23	3	7	5	6	0	8	9	0	7	0	
3 18 414111 4	0	0	20	3	17	12	23	0	0	0	0	0	0	0	0	0	0	
3 18 525111 4	10	23	23	3	17	12	23	2	8	6	7	0	9	10	0	8	0	

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

PERSONNEL DATA

GRADE : E-6
 MOS : 10F505
 IN ARMY : 4YR
 IN ARTILLERY : 4YR
 COMBAT : IN
 ARTILL. CORP. : IN

#SUPERVISED : 50

CREW TASKS

ROUTINARY TASKS

CREW REFS	SYMP CAMP	CON CLIMB	LIFT POLES	WALK STAIRS	LIFT BOXES	OPEN LOCK	TANK COMMANDER				GUNNER			LOADER		DR
							ISSUE PIPE	RANGE	DEP LAY	ISSUE SURSO	IDENT	AIM FIRE	APPLY CURR	ARM LOAD	ARM	
USUAL TIME	15	20	UNSTIPULATED				1	5	3	4	1	6	7	1	5	4
3 19 41111	3	25	20	15	10	15	5	10	5	5	6	12	14	2	10	5
3 19 51503	3	40	5	20	10	20	-1	15	9	-1	5	15	10	3	-1	6
3 19 11411	3	30	15	20	8	6	0	0	0	0	0	0	0	0	7	0
3 19 51531	3	30	15	7	9	15	6	6	4	0	4	7	9	0	9	6
3 19 21311	3	30	15	30	13	9	0	0	0	0	0	0	0	0	6	0
3 19 41311	3	25	15	25	10	9	3	0	0	5	0	0	0	0	7	6
3 19 31111	3	0	20	60	20	5	0	0	0	0	0	0	0	0	0	0
3 19 51511	3	26	15	39	10	9	0	0	0	0	0	0	0	0	0	0
3 19 51523	3	-1	2	5	5	20	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 19 41412	3	30	40	10	15	10	5	7	6	6	3	8	9	2	10	10
3 19 51511	3	40	3	4	4	20	9	7	9	7	4	9	9	3	15	10
3 19 11211	3	0	20	60	10	5	0	0	0	0	0	0	0	0	0	0
3 19 51411	3	31	10	21	4	7	4	7	4	0	4	7	9	3	13	6
3 19 31312	3	30	10	20	10	7	3	8	6	6	3	9	9	3	20	6
3 19 31512	3	35	5	10	4	12	0	0	0	5	0	7	8	3	6	5
3 19 51511	3	30	10	35	6	9	4	0	0	5	0	0	0	0	7	6
3 19 12311	3	19	25	18	8	7	0	0	0	0	0	0	0	0	0	0
3 19 33423	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 19 11311	3	10	23	19	40	6	0	0	0	0	0	0	0	0	6	0
3 19 51511	3	20	33	10	6	9	5	0	4	8	3	9	8	3	9	6
3 19 11312	3	0	0	20	60	10	0	0	0	0	0	0	0	0	0	0
3 19 21111	3	0	0	19	40	10	0	0	0	0	0	0	0	0	0	0
3 19 41514	3	31	31	10	50	4	3	0	0	6	2	7	0	0	8	6
3 19 31211	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 19 31412	3	30	40	15	40	10	3	0	0	5	0	7	8	0	9	0
3 19 31413	3	30	10	10	45	10	6	10	6	9	2	9	8	2	15	6
3 19 41211	3	0	40	10	20	6	4	9	4	9	0	9	8	2	15	6
3 19 41411	3	0	15	55	10	9	0	0	0	0	0	0	0	0	0	0
3 19 41411	3	30	10	40	6	7	4	9	4	6	3	9	9	2	10	5
3 19 51511	3	21	40	12	20	6	6	10	6	9	2	9	9	2	20	6

I HAVE SERVED AS PLATOON SGT. FOR THE LAST YEAR. CONTROLLING AND SUPERVISING 20-24 MEN UNIT IN GARRISON AND THE FIELD IN ADDITION I ALSO TEACH THEM ON SUT TASK.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DETAILED DATA

GRADE : IF-A TANK COMMANDER : 76 6
 POS : 1950 GUNNER :
 IN ARMY : 117K 1100 LOADER :
 IN ARTILLERY : 117K 1 1010 DRIVER :

CONDAI : WHEN :
 ARTIL. COORDIN : 20
 SUPERVISER : 20

CREW TASKS

UPUTARY TASKS

CREW REFP	USUAL TIME, SEC	15	20	DISCIPLINED	LIFT BOXES	CLIMB STAIRS	WALK	OPEN LOCK	TANK COMMANDER				GUNNER			LOADER		DR
									ISSUE FIRE	RANGE	DEP LAY	ISSUE SUBSO	IDENT 1GT	AIM FIRE	APPLY CORR	ARM LOAD	ARM STOP	
3 21 411111	3	10	15	5	30	10	10	10	3	0	0	5	0	0	10	0	0	5
3 21 515431	3	10	20	5	30	10	10	10	4	0	0	5	0	0	10	0	0	5
3 21 114111	3	0	25	5	30	7	15	15	5	0	0	6	0	0	11	0	0	6
3 21 515311	3	0	25	5	25	7	15	15	5	0	0	7	0	0	11	0	0	6
3 21 215111	3	0	30	4	25	6	15	15	5	0	0	7	0	0	12	3	3	7
3 21 415111	3	0	30	4	25	6	15	15	6	6	0	7	2	0	13	3	3	7
3 21 311111	3	10	0	8	30	10	10	10	0	0	0	0	0	0	0	0	0	0
3 21 515111	3	10	0	4	30	10	10	10	0	0	0	0	0	0	0	0	0	0
3 21 515223	3	0	0	5	10	7	10	10	0	0	0	0	0	0	0	0	0	0
3 21 414112	3	0	0	2	10	3	30	30	10	8	5	5	3	0	0	0	0	0
3 21 535111	3	0	0	1	5	1	30	30	10	8	5	5	5	0	0	0	10	10
3 21 112111	3	0	0	5	30	7	10	10	0	0	0	0	0	0	0	0	0	0
3 21 514111	3	0	0	5	30	7	10	10	0	0	0	0	0	0	0	0	0	0
3 21 515112	3	0	0	1	10	1	60	60	5	0	0	0	5	0	10	10	10	10
3 21 515111	3	0	0	1	10	1	6	6	0	0	0	0	0	0	0	0	0	0
3 21 515111	3	0	0	2	10	5	30	30	0	0	0	0	0	0	0	0	0	0
3 21 125111	3	0	0	1	10	1	10	10	0	0	0	0	0	0	0	0	0	0
3 21 534231	3	0	0	1	10	1	10	10	0	0	0	0	0	0	0	0	0	0
3 21 115111	3	0	0	5	30	5	30	30	0	0	0	0	0	0	0	0	0	0
3 21 521111	3	20	0	1	10	1	10	10	0	0	0	0	0	0	0	0	0	0
3 21 113121	3	0	0	1	10	1	10	10	0	0	0	0	0	0	0	0	0	0
3 21 211111	3	0	0	2	15	7	10	10	0	0	0	0	0	0	0	0	0	0
3 21 415311	3	0	0	1	30	2	10	10	0	0	0	0	0	0	0	0	0	0
3 21 515111	3	0	0	1	10	5	30	30	0	0	0	0	0	0	0	0	0	0
3 21 514112	3	0	0	1	10	7	10	10	0	0	0	0	0	0	0	0	0	0
3 21 514113	3	0	0	1	10	5	30	30	0	0	0	0	0	0	0	0	0	0
3 21 412111	3	0	0	1	10	1	10	10	0	0	0	0	0	0	0	0	0	0
3 21 414111	3	0	0	1	10	1	10	10	0	0	0	0	0	0	0	0	0	0
3 21 525111	3	0	0	1	5	1	10	10	0	0	0	0	0	0	0	0	0	0

PLT SGT/CLT IDP. RESPONSIBILITY FOR THE TRAINING OF 10 S.M., AND IDENTIFYING TRAINING DEFICIENCIES, AND TAKING STEPS TO CORRECT THESE DEFICIENCIES. * DFC 6A - JUN 67

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA

GRADE : SP-7
 MOS : 19F400R
 IN ARMY : 12YR
 IN ARTILLERY : 6YR
 COMBAT : YES
 ARTILL. COMBAT : YES
 SUPERVISOR : YES

NAME : MUM LUNG
 DOB : 78
 TANK COMMANDER : 78
 GUNNER : 77
 LOADER : 76
 DRIVER : 76

CREW TASKS

ORDINARY TASKS

CREW REF	SYMPTOM	LOW CLIMB	STAIRS	CLIMB	LIFT	WALK	CLIMB	STAIRS	TANK COMMANDER			GUNNER			LOADER		DR
									ISSUE	RANGE	DEF	ISSUE	DEF	ISSUE	DEF	ISSUE	
1	5	3	4	1	6	7	1	5	4	1	6	7	1	5	4		

UNSTIPULATED

USUAL TIME	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
1 22 41111	5	20	27	3	15	10	12	10	10	10	10	10	10	10	10	10	10	10
1 22 51503	5	29	30	3	10	12	12	12	12	12	12	12	12	12	12	12	12	12
1 22 11411	5	20	25	3	11	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 51531	5	30	35	3	5	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 21311	5	0	25	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 41311	5	17	25	3	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 31111	5	0	25	3	14	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 31311	5	17	090	3	11	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 51523	5	20	30	3	4	14	14	14	14	14	14	14	14	14	14	14	14	14
1 22 41412	5	20	30	3	5	14	14	14	14	14	14	14	14	14	14	14	14	14
1 22 51511	5	30	40	3	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
1 22 11211	5	0	0	3	15	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 51411	5	25	30	3	2.5	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 31312	5	20	30	3	2.5	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 51511	5	35	45	3	1.5	3	17	14	14	14	14	14	14	14	14	14	14	14
1 22 51311	5	25	30	3	2.5	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 12311	5	20	25	3	3	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 33421	5	35	45	3	1	4	15	15	15	15	15	15	15	15	15	15	15	15
1 22 11311	5	0	0	3	5	12	10	10	10	10	10	10	10	10	10	10	10	10
1 22 52111	5	20	30	3	2.5	9	10	10	10	10	10	10	10	10	10	10	10	10
1 22 11312	5	20	30	3	3.5	11	10	10	10	10	10	10	10	10	10	10	10	10
1 22 21111	5	20	27	3	3	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 22411	5	25	30	3	2.5	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 41514	5	35	45	3	1.5	4	15	15	15	15	15	15	15	15	15	15	15	15
1 22 31211	5	20	30	3	3	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 31411	5	40	45	3	1	2	15	15	15	15	15	15	15	15	15	15	15	15
1 22 31413	5	0	-1	-1	-1	-1	20	20	20	20	20	20	20	20	20	20	20	20
1 22 41211	5	25	30	3	3	10	10	10	10	10	10	10	10	10	10	10	10	10
1 22 41411	5	25	30	3	2.5	4	10	10	10	10	10	10	10	10	10	10	10	10
1 22 52511	5	40	50	3	0.5	1	15	15	15	15	15	15	15	15	15	15	15	15

0=NO INCREASE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

0160 TANK CREW

UTBIAH 34115M : 50

CREW TASKS

ROUTINE TASKS

CREW	SYMP	CON	CLIMB	LIFT	CLIMB	WALK	LIFT	UPEN	TANK COMMANDER		GUNNER		LOADER		STOP		
									ISSUE	RANGE	UPP	ISSUE	IDENT	AIM		APPLY	ARM
RESP	TIME	SEC	15	20	STAIRS	STAIRS	BOXES	LOCK	FIRE	CMD	LAY	SURSO	CMD	FIRE	CURN	ARM	ARM
-----UNSTIPULATED-----																	
323	41111	5	30	35	3	3	2	40	1	5	3	4	1	6	7	1	5
323	51543	4	-1	-1	-1	-1	-1	40	4	3	8	10	6	10	12	7	6
323	11411	4	-1	-1	0.5	0.5	30	40	6	6	10	12	4	8	14	-1	-1
323	51531	4	-1	-1	-1	-1	40	40	3	10	7	0	0	9	9	7	12
323	21311	4	20	0	2	2	30	30	2	7	6	8	2	0	10	4	10
323	41311	4	20	0	3	3	30	30	2	0	5	6	0	7	9	2	8
323	31111	5	30	0	4	4	3	20	0	0	0	0	0	0	0	0	0
323	31311	5	30	0	1	1	30	30	3	0	5	6	0	8	0	0	0
323	51523	5	30	40	-1	-1	1	50	3	7	5	8	3	0	9	3	8
323	51511	4	-1	-1	0.5	0.5	30	30	3	6	5	6	3	0	9	3	10
323	41412	4	30	40	-1	-1	1	30	3	0	5	7	0	0	9	3	10
323	11211	5	30	40	-1	-1	1	30	3	0	5	7	0	0	9	3	10
323	51411	4	30	40	1	1	1	30	3	7	7	7	0	8	10	4	10
323	31312	5	30	50	-1	-1	1	30	3	0	5	7	0	0	9	3	10
323	31313	5	30	50	1	1	1	30	0	0	5	6	0	0	9	3	10
323	51311	5	30	30	1	1	2	30	0	0	5	6	0	0	9	3	10
323	12311	4	30	30	1	1	1	30	0	0	6	6	0	8	9	3	10
323	34231	4	30	40	1	1	1	30	0	0	0	0	0	0	0	0	0
323	11311	5	30	40	3	3	3	20	0	0	0	0	0	0	0	0	0
323	11312	5	30	40	1	1	1	30	0	0	0	0	0	0	0	0	0
323	21111	5	30	40	1	1	1	30	0	0	0	6	0	0	9	2	8
323	21111	5	30	40	2	2	3	20	0	0	0	0	0	0	0	0	0
323	21111	5	30	40	1	1	1	30	0	0	0	6	0	0	9	3	10
323	41531	5	30	40	1	1	1	30	3	6	4	6	0	8	10	3	10
323	31211	5	-1	-1	-1	-1	-1	40	3	2	4	6	0	0	9	3	10
323	31211	5	30	40	1	1	1	30	3	0	4	6	0	0	9	3	10
323	31412	5	30	40	1	1	1	40	0	0	5	6	0	0	9	3	10
323	31413	5	-1	-1	-1	-1	-1	40	0	0	5	6	0	0	9	3	10
323	41211	5	30	40	1	1	1	30	0	0	0	6	0	0	0	0	0
323	41411	5	30	40	1	1	1	30	0	0	0	0	0	0	0	0	0
323	52111	5	30	40	-1	-1	-1	40	0	0	5	5	0	0	9	3	10

PLT 54216A-11

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

UTLINOGRAPHIC DATA

GRADE : F-A TANK COMMANDER

MOS : 1011 GUNNER

IN ARMY : 04K KIDN LOADER

IN ARTILLERY : 04K A DRIVER

COMBAT : 00 WHEN

ARTILL. COMBAT : 00

#SUPERVISED : 250

WHEN HOW LONG

MO YR YR MO

6

CREW TASKS

ORDINARY TASKS

CREW REF	SYMP COMP	CON CLIMB	STAIRS	LIFT BOXES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	TANK COMMANDER				GUNNER			LOADER		DR STOP
									ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SUBSO CMD	IDENT ICI	AIM FIRE	APPLY CURR	ARM	LOAD ARM	
USUAL TIME: SEC 10 20																		
3 26 411111	0	0	5	60	10	-1	10	10	6	-1	0	0	5	0	0	3	0	0
3 26 515431	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 114111	0	0	3	20	5	10	5	10	5	0	0	0	3	0	0	3	0	0
3 26 515311	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 215111	0	0	5	30	10	10	10	10	4	0	0	0	3	0	0	3	0	0
3 26 415111	0	0	3	20	10	10	10	10	5	0	0	0	3	0	0	3	0	0
3 26 511111	0	0	10	10	5	15	5	15	5	0	0	0	3	0	0	3	0	0
3 26 315111	0	0	3	3	5	15	5	15	8	0	5	0	5	0	0	5	0	0
3 26 515223	0	0	1	3	2	15	2	15	10	10	7	0	10	7	0	10	0	0
3 26 414112	0	0	3	10	3	5	3	5	4	0	0	0	3	0	0	2	0	0
3 26 515111	-1	-1	-5	30	10	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 112111	0	0	5	30	10	5	10	5	4	0	0	0	5	0	0	3	0	0
3 26 514111	0	0	-1	1	2	10	5	10	5	0	5	0	5	0	0	10	0	0
3 26 315112	0	0	3	10	5	10	5	10	5	0	0	0	3	0	0	3	0	0
3 26 515113	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 125111	0	0	2	2	3	10	3	10	10	0	-5	0	10	0	0	10	0	0
3 26 334231	-1	-1	-1	-1	-1	-1	-1	-1	10	0	0	0	3	0	0	5	0	0
3 26 515111	0	0	4	30	5	5	5	5	5	-1	-1	-1	3	0	0	3	0	0
3 26 115111	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 521111	0	0	1	5	2	15	2	15	10	7	6	0	5	0	0	5	0	0
3 26 115121	0	0	3	3	3	15	3	15	5	0	0	0	3	0	0	3	0	0
3 26 211111	0	0	2	3	2	15	2	15	10	0	0	0	3	0	0	3	0	0
3 26 415314	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 312111	0	0	1	5	2	10	2	10	10	7	5	0	4	0	0	5	0	0
3 26 514112	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 26 314113	0	0	1	1	-1	15	-1	15	30	15	10	0	5	0	0	10	0	0
3 26 412111	0	0	2	10	2	10	2	10	0	7	4	0	4	0	0	5	0	0
3 26 414111	0	0	1	5	3	10	3	10	10	0	0	0	5	0	0	5	0	0
3 26 525111	0	0	1	3	1	10	1	10	30	15	10	30	15	0	0	5	0	0

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

OFFICER/GRAPHIC DATA
 GRADE : SF-6
 MOS : 19F50
 IN ARMY : 10YR
 IN ARTILLERY : 0YR
 WHEN : 6
 TANK COMMANDER :
 GUNNER :
 LOADER :
 DRIVER :
 COMBAT :
 ARTIL. CORPATION :
 SUPERVISED : 20

CREW TASKS

ORDINARY TASKS

CREW RESP	SYMP COMP	CON CLIMB STAIRS	LIFT BOXES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	ISSUE FIRE CMD	TANK COMMANDER			GUNNER			LOADER			DR
									RANGE	DEP LAY	ISSUE SUBSO CMD	IDENT TGT	AIM FIRE	APPLY CURR	ARM	LOAD ARM	STOP	
USUAL TIME, SEC																		
3 27 411111	0	30	35	5	15	10	30	20	10	5	3	4	1	6	7	1	5	4
3 27 515031	0	60	50	1	2	2	60	60	25	30	9	10	5	20	15	6	10	0
3 27 114111	0	20	30	6	10	7	50	10	10	12	10	10	10	0	15	3	25	10
3 27 513111	0	55	60	2	5	1	60	60	60	60	60	60	40	35	50	25	35	15
3 27 213111	0	30	30	6	10	8	25	8	15	20	20	20	10	0	10	3	10	5
3 27 413111	0	40	45	2	2	5	35	15	10	10	15	15	10	0	15	4	10	0
3 27 311111	0	25	35	5	10	5	40	6	15	20	25	25	10	15	20	6	11	7
3 27 313111	0	35	55	1	2	2	30	15	20	20	25	25	10	15	20	10	15	10
3 27 515221	0	45	40	1	1	1	40	20	35	40	30	30	15	20	35	10	25	15
3 27 414112	0	50	45	2	1	1	60	55	50	50	50	50	30	30	40	15	25	20
3 27 515111	0	30	25	1	15	10	20	45	0	10	10	10	3	0	11	3	10	6
3 27 514111	0	30	30	2	3	2	30	45	45	35	50	50	15	15	25	15	15	0
3 27 313112	0	40	40	1	1	1	25	45	45	45	45	45	15	20	25	10	25	15
3 27 515111	0	40	55	1	1	1	50	60	60	60	60	60	55	50	60	50	60	40
3 27 513111	0	35	40	2	5	4	45	20	35	30	35	35	15	15	20	10	20	10
3 27 123111	0	50	30	1	1	2	55	10	15	15	15	15	15	10	15	6	10	6
3 27 314231	0	50	45	1	1	1	40	45	55	55	55	60	25	25	35	15	25	10
3 27 113111	0	20	25	1	15	10	10	3	6	5	5	6	3	0	10	2	0	5
3 27 521111	0	30	30	2	5	3	25	15	20	25	25	25	5	15	20	5	15	8
3 27 113121	0	20	30	6	10	6	30	4	0	0	10	10	6	7	10	3	10	7
3 27 211111	0	20	25	0	10	5	20	15	20	25	15	15	2	0	10	5	10	5
3 27 214111	0	25	30	3	3	2	25	15	20	25	15	15	0	10	15	10	15	7
3 27 415114	0	40	40	1	1	1	40	20	35	40	30	30	15	20	35	10	25	15
3 27 312111	0	30	30	3	5	5	25	7	0	10	10	10	6	10	15	4	10	0
3 27 314112	0	25	30	2	2	2	35	10	25	25	25	25	15	10	20	10	15	10
3 27 314111	0	25	25	5	10	3	30	7	10	10	10	10	5	0	15	3	10	7
3 27 414111	0	35	30	2	5	3	25	15	20	20	10	10	10	10	15	10	20	10
3 27 525111	0	30	30	1	2	1	40	25	35	35	40	40	15	20	35	10	15	15

PERFORMED ALL MAINTENANCE ON UPON VEH. AND PERFORMED MAINTENANCE ON 1A2.1-02-A, 154, TS48, P176, RIR152, RIR60PA, GAZ-69 AND RMP.
 TANK SFC. ILADEF.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA
 GRADE : IF-4
 MOS : 310F30
 IN ARMY : 310YK
 IN ARTILLERY : 6YK
 WHEN :
 COMBAT : IN
 ARTIL. CORPATION :
 WHEN :
 #SUPERVISED : 50

CREW TASKS

ORDINARY TASKS																
CREW RESP	SYMP CUMP	CON STAIRS	CLIMB BOXES	WALK	LIFT BOXES	UPEN LOCK	TANK COMMANDER				GUNNER			LOADER		DN STOP
							ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SURSO CMD	IDENTI FIRE	AIM FINE	APPLY CORN	ARM	LOAD ARM	
USUAL TIME, SEC	15	20	UNSTIPULATED				1	5	5	4	1	6	7	1	5	4
3 28 411111	3 45	40	4	5	8	30	3	9	10	6	4	9	10	2	8	7
3 28 515431	3 45	80	6	30	15	45	3	15	12	10	9	14	11	3	15	12
3 28 114111	3 20	60	1	5	3	45	3	6	5	3	6	8	5	2	6	7
3 28 515311	3 20	70	0	120	20	45	2	0	11	6	5	5	11	3	15	11
3 28 213111	3 16	0	6	60	15	45	3	3	4	0	4	0	0	2	7	7
3 28 413111	3 16	0	7	120	20	45	2	0	6	0	4	0	0	2	8	7
3 28 311111	3 0	0	7	100	15	45	3	3	7	0	4	0	0	2	6	7
3 28 313111	3 0	0	7	100	15	45	3	3	7	0	4	0	0	2	6	7
3 28 515223	3 35	45	1	5	2	85	3	8	15	8	15	15	20	4	12	14
3 28 414112	3 25	50	3	45	4	45	3	3	0	0	5	0	9	2	10	10
3 28 515111	3 45	50	2	40	3	70	3	5	9	12	7	10	15	3	15	11
3 28 112111	3 0	0	0	120	15	45	2	0	5	0	4	0	0	2	7	7
3 28 514111	3 45	60	2	30	3	50	3	10	15	10	15	17	12	2	15	12
3 28 315112	3 25	45	6	30	3	45	3	3	6	0	5	0	0	2	7	7
3 28 515111	3 0	0	0	60	7	45	3	3	0	0	8	0	0	2	15	8
3 28 123111	3 0	0	0	60	6	45	3	3	0	0	5	0	0	2	15	7
3 28 314231	3 25	40	3	25	3	55	3	3	0	6	5	0	8	2	8	7
3 28 113111	3 0	0	10	120	20	45	3	0	0	7	9	0	8	2	15	12
3 28 521111	3 20	35	3	40	3	55	3	3	7	0	0	0	0	0	0	0
3 28 113121	3 16	25	6	40	3	60	3	3	0	7	7	8	10	2	10	11
3 28 211111	3 0	0	0	120	12	45	3	3	0	7	5	0	0	2	8	9
3 28 224111	3 20	40	3	50	6	55	3	3	0	7	0	0	0	2	6	7
3 28 415310	3 20	30	1	5	1	75	3	3	-1	8	7	6	10	2	13	10
3 28 312111	3 20	30	3	50	6	50	3	3	-1	-1	-1	-1	-1	-1	-1	-1
3 28 314112	3 25	55	3	40	6	55	3	4	0	7	8	0	9	2	8	8
3 28 314115	3 25	55	1	5	1	70	3	4	0	10	10	10	10	3	17	10
3 28 412111	3 20	0	3	60	6	50	3	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 28 414111	3 30	40	3	15	4	75	3	3	0	7	6	0	0	2	8	7
3 28 525111	3 25	40	1	10	2	70	3	3	-1	-1	-1	-1	-1	-1	-1	-1

WAS IN GERMANY IN 20Y AT ADJON. FIVE UNDEFO FOR WAS A PIATON. SERGEANT FOR 10 ENTIRE YEAR.

M60 TANK CREW

UNSUPERVISED :>50

ROUTINARY TASKS

INSTRUCTION M4043 NEW TEAM TEACHING FIRE CONTROL, LASTING ABILITY OF A-3 SYSTEM!

460 TANK CREW

WSIIFKVIEN : 20

CREW TASKS

ROUTINARY TASKS:

[illegible]

USUAL TIME, SEC	20	MULTIPLIED
15		

[illegible]

DURING THE PAST YEAR TECH INFL ANALYST SOVIET ARMOR

0=NO INCREASE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

W60 TANK CREW

CREW TASKS

OPTIONARY TASKS

[illegible]

TA'N SFTING LEADER T.D A CAV INMP. SUPERVISE TANK SECTION AND 20 PEOPLE, LEAD TANK SECTION IN MANIERS AND GUNNFY EXERCISES.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 IF-A TANK COMMANDER 74 0
 M60 11453 GUNNER 73 1 6
 IN ARMY 11111 AND LOADER 72 1 6
 IN ARTILLERY 11111 6 DRIVER 72 1 6
 COMBAT IN WHEN
 ARTILL. COMBAT: M SUPERVISED: 20

CREW TASKS

ORDINARY TASKS

CREW RFSF	SYMP COMP	CON STATES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	TANK COMMANDER				GUNNER				LOADER		DR STOP
							ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SUSO CMD	IDENT 161	AIM FIRE	APPLY CORR	ARM LOAD	ARM		
USUAL TIME, SEC																	
15	20	UNSTIPULATED				1	5	3	4	1	6	7	1	5	4		
3 34 411111 4	20	45	4.5	20	12	30	4	4	7	5	6	3	8	9	3	9	8
3 34 515231 4	-1	-1	-1	-1	-1	300	8	8	15	15	10	6	10	15	-1	-1	-1
3 34 114111 4	-1	-1	-1	-1	-1	360	10	10	-1	-1	15	10	15	15	-1	-1	-1
3 34 515311 4	-1	-1	-1	-1	-1	300	5	5	8	7	7	0	0	0	0	0	0
3 34 213111 4	20	30	4	4	14	20	0	0	0	0	0	0	0	0	0	0	0
3 34 413111 4	20	35	3	5	10	30	0	0	0	0	0	0	0	0	0	0	0
3 34 311111 4	0	0	5	10	15	25	3	3	8	5	6	4	10	13	0	10	9
3 34 313111 4	20	45	3.5	5	14	45	3	3	8	7	6	3	8	9	0	9	8
3 34 51523 4	-1	-1	-1	-1	-1	120	3	3	9	-1	6	6	12	10	0	-1	-1
3 34 414112 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 34 515111 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 34 112111 4	0	0	5	15	20	25	0	0	0	0	0	0	0	0	0	0	0
3 34 514111 4	-1	-1	-1	-1	-1	-1	5	5	8	7	6	4	10	13	0	-1	-1
3 34 313112 4	-1	-1	-1	-1	-1	-1	-1	-1	9	7	6	5	10	15	0	-1	-1
3 34 315113 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	8	15	15	0	-1	-1
3 34 513111 4	25	35	2	5	7	45	-1	-1	-1	-1	-1	5	10	15	0	-1	-1
3 34 123111 4	25	40	4	8	11	45	3	3	6	5	6	3	9	10	0	15	15
3 34 334231 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	12	10
3 34 113111 4	0	0	5	15	20	15	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 34 521111 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	8	7
3 34 113121 4	0	0	4.5	10	20	30	0	0	0	0	0	0	0	0	-1	-1	-1
3 34 211111 4	0	0	5	15	16	45	0	0	0	0	0	0	0	0	0	7	6
3 34 214111 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0
3 34 415311 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	-1	15
3 34 312111 4	25	45	3.5	5	10	55	0	0	0	5	6	5	12	15	0	12	10
3 34 314112 4	-1	-1	-1	-1	-1	-1	5	5	-1	-1	10	6	15	18	5	-1	-1
3 34 314113 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	10	6	15	18	5	-1	-1
3 34 412111 4	25	45	3	5	6	50	0	0	8	6	7	5	9	10	3	15	12
3 34 414111 4	-1	-1	-1	-1	-1	-1	5	5	10	8	6	5	9	9	3	-1	-1
3 34 525111 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

PLT SGT IN A ARMOR CAVALRY

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 5990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

MGO TANK CREW

DEMOGRAPHIC DATA
 GRADE : E-6
 MOS : 59F50
 IN ARMY : 21YR
 IN ARTILLERY : 21YR
 WHEN :
 COMBAT : N
 ARTIL. COMBAT : N
 SUPERVISED : 550

CREW TASKS

ROUTINARY TASKS

SYMP COMP	CMB CLIMB	STAIRS	WALK	LIFT BOXES	OPEN LOCK	TANK COMMANDER				GUNNER			LOADER		DR
						ISSUE FIRE CMD	RANGE	UPP LAY	ISSUE SURSO CMD	IDENT IGI	AIM FIRE	APPLY CURR	ARM LOAD	ARM	
USUAL TIME, SEC	15	20	UNSTIPULATED												
3 37 41111	3	25	15	5	35	3	6	5	6	3	9	9	0	7	0
3 37 51543	3	-1	2	1	60	11	15	-1	11	-1	15	15	2	-1	15
3 37 11411	3	30	5	4	60	2	8	6	0	3	8	8	0	9	5
3 37 51531	3	-1	2	2	60	3	15	8	5	5	12	12	0	30	15
3 37 21311	3	25	5	5	35	3	0	4	0	2	0	10	0	8	0
3 37 41311	3	35	6	5	60	4	10	6	8	3	9	11	0	11	5
3 37 31111	3	30	5	5	60	4	6	4	6	2	8	8	0	8	0
3 37 31311	3	45	5	5	60	3	8	5	5	3	9	11	0	11	0
3 37 51523	3	-1	2	1	95	6	15	15	7	5	17	20	5	-1	15
3 37 41412	3	-1	1	1	95	5	15	9	12	5	15	17	3	-1	15
3 37 53511	3	-1	0.5	1	95	8	20	25	10	10	20	21	8	-1	15
3 37 11211	3	20	5	5	50	3	8	6	6	3	8	9	0	11	0
3 37 51411	3	-1	0.5	1	95	5	20	20	12	5	11	13	3	15	6
3 37 31312	3	-1	0.5	1	90	8	30	15	8	9	15	15	3	-1	10
3 37 31511	3	-1	0.5	1	95	3	10	15	10	10	25	28	3	-1	15
3 37 51311	3	40	5	3	95	3	10	7	9	5	15	17	2	15	8
3 37 12311	3	30	2	1	85	3	10	7	7	5	9	10	0	11	0
3 37 33423	3	-1	0.5	1	120	9	15	12	10	5	12	14	2	-1	10
3 37 11311	3	20	4	6	55	3	7	5	6	3	8	9	0	8	0
3 37 52111	3	30	3	1	60	3	15	15	8	5	13	15	0	11	0
3 37 11312	3	-1	1	1	60	3	8	7	8	4	10	12	0	18	0
3 37 21111	3	30	4	1	70	3	8	6	8	4	13	15	0	12	0
3 37 41514	3	-1	1	1	110	5	12	10	7	7	16	17	3	35	8
3 37 22411	3	-1	-1	1	240	10	-1	15	10	-1	-1	-1	5	-1	15
3 37 31211	3	-1	-1	2	120	15	15	15	7	4	15	16	2	10	6
3 37 31411	3	45	2	1	105	8	25	25	12	8	20	25	3	-1	8
3 37 31412	3	-1	0.5	1	200	8	25	25	10	15	25	30	2	-1	10
3 37 41211	3	40	2	1	220	5	15	12	8	6	14	16	5	13	6
3 37 41411	3	-1	0.5	1	225	5	15	15	8	5	12	15	5	20	8
3 37 52511	3	-1	0.5	1	225	4	25	25	12	15	22	25	3	-1	10

DEMOGRAPHIC DATA
 GRADE : F-4
 MOS : 11950
 IN ARMY : 10YR
 IN ARTILLERY : 10YR
 WHEN :
 COMBAT : IN
 ANTI-A. CUMPRATN :
 #SUPERVISED : 250

0=NO INCREASE ABOVE USUAL TIME
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M60 TANK CREW

CREW TASKS

UPUTNARY TASKS

CREW	SNIP	CON	CLIMB	LIFT	CLIMB	WALK	LIFT	UPEN	TANK COMMANDER	GUNNER	LOADER	DR							
													MFSP	COMP	STAIRS	RUYS	STAIRS	BOXES	LOCK
USUAL TIME, SEC										INSTIPULATED									
3 39 411111	4	30	60	3	5	20	5	20	10	10	10	10							
3 39 515031	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 114111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 515311	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 213111	4	20	30	3	5	20	6	20	10	10	10	10							
3 39 413111	4	20	30	3	5	20	6	20	10	10	10	10							
3 39 311111	4	19	20	3	5	20	6	20	10	10	10	10							
3 39 313111	4	19	20	3	5	20	6	20	10	10	10	10							
3 39 515223	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 414112	4	20	30	3	5	20	6	20	10	10	10	10							
3 39 535111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 112111	4	15	30	4	4	20	3	20	10	10	10	10							
3 39 514111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 313112	4	20	30	3	5	20	6	20	10	10	10	10							
3 39 513111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 513111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 123111	4	15	30	4	4	20	3	20	10	10	10	10							
3 39 334231	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 113111	4	15	30	4	4	20	3	20	10	10	10	10							
3 39 521111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 113121	4	25	30	5	5	20	7	20	10	10	10	10							
3 39 211111	4	15	30	4	4	20	3	20	10	10	10	10							
3 39 224111	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 415314	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 312111	4	15	30	4	4	20	3	20	10	10	10	10							
3 39 314112	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 314112	4	-1	-1	1	1	10	1	30	10	10	10	10							
3 39 412111	4	15	35	2	2	10	3	15	10	10	10	10							
3 39 414111	4	15	35	2	2	10	3	15	10	10	10	10							
3 39 523111	4	-1	-1	1	1	10	1	30	10	10	10	10							

LOGISTICS CHIEF, TANK PLY SGT, GUNNERY AND TACTICS INSTRUCTOR, 25 MM CHAINGUN INSTRUCTOR, COMPANY TANK LBN, USMC

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M60 TANK CREW

DEMOGRAPHIC DATA
 GRADE : F-7
 MOS : 1811
 IN ARMY : 11YR
 IN ARTILLERY : 11YR
 CUBAT : EN
 ARTIL. COMBAT : N
 WHEN : 75
 HOW LONG : 3 YR
 WHEN : 74
 HOW LONG : 2 YR
 WHEN : 71
 HOW LONG : 2 YR
 WHEN : 72
 HOW LONG : 3 YR
 UNSUPERVISED : 50

CREW TASKS									
ORDINARY TASKS									
CREW	SYMP	LOW	CLIMB	LIFT	CLIMB	WALK	LIFT	OPEN	DR
REFP	COMP	STAIRS	RUXES	STAIRS	STAIRS	STAIRS	BOXES	LOCK	STOP
USUAL TIME, SEC	15	20	20	20	20	20	20	20	20
3 40 411111	0	00	50	3	10	10	3	15	5
3 40 515431	3	-1	-1	1	2	2	1	45	8
3 40 114111	0	25	40	4	5	5	4	15	50
3 40 515111	4	-1	-1	-1	0.5	0.5	-1	30	0
3 40 215111	4	17	30	4	17	17	5	15	10
3 40 415111	4	20	30	5	20	20	4	15	9
3 40 311111	4	10	30	4	15	15	5	15	2
3 40 313111	4	11	40	4	15	15	5	15	7
3 40 515221	4	17	40	1	15	15	5	17	0
3 40 414111	4	00	75	4	15	15	5	25	0
3 40 515111	4	05	-1	3	4	4	5	27	7
3 40 112111	4	17	25	5	20	20	7	30	0
3 40 514111	4	19	45	3	10	10	4	18	6
3 40 313111	4	00	00	2	15	15	3	16	8
3 40 315111	4	-1	-1	-1	2	2	1	23	5
3 40 513111	4	20	55	3	5	5	3	17	7
3 40 123111	4	17	21	4	10	10	3	16	5
3 40 334231	4	0	0	4	12	12	4	15	6
3 40 113111	4	0	0	5	20	20	4	15	5
3 40 521111	4	999	999	5	30	30	2	15	6
3 40 113121	4	0	0	5	20	20	4	15	0
3 40 211111	4	0	0	5	20	20	4	15	0
3 40 224111	4	0	0	3	10	10	4	15	0
3 40 415314	4	20	40	2	7	7	2	30	5
3 40 312111	4	17	25	3	10	10	5	15	5
3 40 314112	4	18	30	2	4	4	2	17	0
3 40 314113	4	20	35	4	5	5	2	25	0
3 40 412111	4	17	30	5	20	20	4	15	5
3 40 414111	4	25	999	5	15	15	4	17	0
3 40 525111	4	00	70	2	5	5	3	20	7

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MOON TANK CREW

CREW TASKS

CURRICULAR TASKS

CREW	PUMP	CON	LIFT STAIRS	LIFT CLIMB POLES STAIRS	WALK	LIFT BOXES	OPEN LOCK
WFSP							
VISUAL TIME,SFL 15 20 UNUTILIZED							

TANK COMMANDER				GUNNER			LOADER		DR
ISSUE	RANGE	DEP	ISSUE	IDENT	AIM	APPLY	ARM	LOAD	STOP
FIRE		LAY	SURGE	IGT	FIRE	CURR		ARM	
CMD			CMD						
1	5	3	4	1	6	7	1	5	4

MUSTYPULATED

22

ADDITIONAL TIME, SFL 15

4

5

1

7

—

51

1

A1

13

6

9

74

11

11

[illegible]

272

PLATOON COMMANDER TANK PLATOON STATIONED UMINAWA, JAPAN AND REPUBLIC OF KOREA AND REPUBLIC OF PHILIPPINES. USMC

MOON TANK CREW

#SIIPTRVLSLN :>50

CREW TASKS

APPENDIX A TASKS

CREW REFSP	SYMP CMT	CON STATIONS	CLIMB MOVES	WALK BOXES	LIFT BOXES	UPEN LOCK	TANK COMMANDER			GUNNER			LOADER			DR STOP
							ISSUE FIRE CMT	RANGE	DEF LAY	ISSUE SURSO CMT	IDENI TGT	AIM FIRE	APPLY CMT	ARM	LOAD ARM	
		15	20	UNSTIMULATED			1	5	3	4	1	6	7	1	5	4
3 02 411111	0	40	60	10	2	60	5	10	7	7	5	8	9	4	8	5
3 02 515431	0	-1	50	5	3	40	20	30	25	10	10	25	20	10	40	5
3 02 115111	0	30	50	5	5	40	6	10	10	7	4	9	9	2	9	5
3 02 515111	3	60	-1	5	2	45	4	7	7	6	3	7	9	3	10	5
3 02 213111	3	20	40	10	3	30	0	6	4	0	3	7	0	3	7	0
3 02 413111	0	30	45	5	3	35	3	7	6	5	3	7	9	3	7	0
3 02 311111	3	40	60	5	3	40	3	7	5	5	3	9	10	3	9	5
3 02 313111	0	40	50	5	3	45	3	7	7	6	3	9	9	3	9	5
3 02 515223	0	-1	-1	1	2	45	5	7	5	6	4	12	15	3	15	5
3 02 414112	3	30	40	5	2	30	2	9	8	6	3	8	10	2	9	5
3 02 535111	0	-1	-1	1	-1	70	4	9	5	6	3	10	12	3	15	6
3 02 112111	0	20	40	5	3	45	2	7	5	5	2	8	8	0	7	0
3 02 514111	0	-1	-1	1	-1	70	5	9	8	10	4	9	12	3	9	6
3 02 313112	0	-1	-1	2	2	50	2	6	5	0	2	0	9	0	8	0
3 02 313113	3	-1	-1	3	1	60	4	6	5	5	2	0	9	3	9	5
3 02 513111	3	25	60	5	2	50	4	6	5	6	2	7	9	2	9	0
3 02 123111	3	35	60	5	2	45	2	6	4	5	3	7	9	2	9	6
3 02 334231	0	-1	-1	2	-1	60	5	9	5	8	3	9	10	2	10	6
3 02 334231	0	-1	-1	2	-1	45	2	6	5	6	3	7	8	2	9	6
3 02 113111	0	50	40	5	-1	60	4	8	5	7	4	8	9	2	12	6
3 02 113121	0	20	50	2	1	60	3	7	6	6	2	8	9	2	10	6
3 02 213111	3	40	60	5	2	40	4	6	6	6	2	8	9	2	10	6
3 02 224111	3	20	40	5	2	40	3	7	8	6	3	8	9	2	10	6
3 02 415114	0	-1	-1	-1	-1	70	5	12	10	12	3	10	13	3	16	7
3 02 312111	3	40	40	2	2	60	3	6	6	5	3	7	9	2	7	6
3 02 312111	3	40	60	2	1	60	3	6	6	5	2	8	9	2	10	6
3 02 314113	0	-1	-1	1	-1	60										

DEMOGRAPHIC DATA

GRADE : TANK COMMANDER WHEN YR 75 5
 M0S : 11053111 75 5
 IN ARMY : 11053111 75 5
 IN ARTILLERY : 11053111 75 5
 COMBAT : 11053111 75 5
 ANTI-AIRCRAFT : 11053111 75 5
 SUPERVISED : 50

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M60 TANK CREW

CREW TASKS

UPUTARY TASKS

CREW REFSP	SYMP CUMP	CON STAIRS	CLIMB MOYES	WALK BOXES	LIFT LOCK	UPLN LOCK	ISSUE FIRE CND	RANGE	DEP LAY	ISSUF SUBSO CND	GUNNER			LOADER		DR
											IDENT	AIM PIPE	APPLY CORR	ARM	LOAD ARM	
UNSTIPULATED																
3 43 411111	0	25	60	3	6	45	0	5	3	4	1	6	7	1	5	4
3 43 515431	0	-1	-1	-1	3	60	7	15	20	7	7	0	0	0	7	7
3 43 114111	0	20	40	2	3	30	0	0	0	0	0	0	10	0	-1	15
3 43 515311	0	30	-1	1	2	20	0	7	10	0	0	0	0	0	0	10
3 43 213111	0	0	25	2	4	30	0	0	0	0	0	0	0	0	0	0
3 43 413111	0	25	60	2	3	35	0	0	0	0	0	0	0	0	0	0
3 43 311111	0	20	25	3	4	35	0	0	0	0	0	0	0	0	0	0
3 43 313111	0	20	35	3	3	35	0	0	0	0	0	0	0	0	0	0
3 43 515111	0	-1	-1	1	2	40	0	10	20	0	0	0	0	0	15	10
3 43 414112	0	30	-1	2	2	40	0	0	10	0	10	0	0	0	20	10
3 43 515111	0	-1	-1	1	40	45	0	7	10	10	10	0	15	0	20	10
3 43 112111	0	20	40	2	3	45	0	0	0	0	0	0	0	0	8	0
3 43 514111	0	30	40	2	3	40	0	0	10	10	0	0	10	0	15	10
3 43 313113	0	-1	-1	1	1	40	0	0	10	10	0	0	0	0	20	10
3 43 315113	0	-1	-1	-1	-1	40	5	10	10	10	0	0	10	5	-1	15
3 43 513111	0	30	30	3	3	40	0	0	0	0	0	0	0	0	10	10
3 43 123111	0	20	30	4	4	40	0	0	0	0	0	0	0	0	0	0
3 43 314231	0	30	60	2	1	40	3	10	15	15	0	0	10	0	10	0
3 43 113111	0	0	30	4	3	40	0	0	0	0	0	0	0	0	0	0
3 43 521111	0	30	30	3	3	40	0	0	10	10	0	8	10	0	10	0
3 43 113121	0	30	30	3	3	40	0	0	0	0	0	0	0	0	10	0
3 43 211111	0	0	0	4	4	40	0	0	0	0	0	0	0	0	0	0
3 43 224111	0	30	-1	2	3	40	0	10	15	15	0	0	10	0	15	10
3 43 415310	0	-1	-1	-1	3	60	10	25	20	15	15	10	20	0	-1	10
3 43 312111	0	25	70	1	2	40	0	0	0	0	0	0	0	0	10	0
3 43 314112	0	-1	-1	1	1	40	5	10	20	15	5	10	20	0	20	10
3 43 314113	0	-1	-1	0.5	1	40	5	20	15	15	10	10	10	5	50	15
3 43 412111	0	25	60	3	3	40	0	0	0	0	0	0	0	0	10	0
3 43 414111	0	-1	-1	30	1	40	0	0	0	0	0	0	0	0	0	0
3 43 525111	0	-1	-1	-1	1	60	5	15	30	50	10	10	20	5	30	15

OWILL SAFEFANI

02ND INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 92ND REPLY (FOR CONFIDENCE)

M60 TANK CREW

PHOTOGRAPHIC DATA WHEN HUM LUNG
 : F-4 TANK COMMANDER 79 YN MO
 : 19K3X GUNNER : 75 2
 : 2 YN LOADER : 75 0
 : 2 YN DRIVER : 75

COMBAT IN WHEN
 ANTI- COMBATIN #SUPERVISOR : 20

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	CLIMB	LIFT	POXES	STAIRS	WALK	LIFT	UPEN	LOCK	TANK COMMANDER				GUNNER				LOADER		DR
											ISSUE	RANGE	DEP	ISSUE	IDENT	AIM	APPLY	CORN	ARM	LOAD	STOP
RFSP	USUAL TIME, SEC	15	20	UNSTIPULATED	1	5	3	4	1	6	7	1	5	3	4	1	6	7	1	5	4
3 00 411111	5	20	60	2	3	1	0.5	3	1	60	3	30	5	5	0	3	15	10	0	9	6
3 00 515031	5	20	50	1	2	1	0.5	2	1	30	15	7	20	40	10	2	20	20	5	30	15
3 00 114111	5	20	90	2	1	1	0.5	1	1	45	2	10	5	6	3	7	9	0	0	0	6
3 00 515311	5	20	40	1	2	1	0.5	2	1	45	2	10	12	0	3	7	11	0	0	0	6
3 00 213111	5	20	40	2	2	2	1	3	2	20	2	6	5	6	3	7	10	0	0	0	0
3 00 413111	5	20	40	2	2	2	1	3	2	15	3	6	6	6	3	9	10	0	0	0	0
3 00 311111	5	0	30	4	4	4	2	5	5	10	0	6	5	6	2	0	0	0	0	0	0
3 00 313111	5	10	40	4	4	4	10	4	4	30	0	7	4	6	2	0	0	0	0	0	0
3 00 515223	5	30	40	1	1	1	1	3	3	60	0	15	20	4	5	10	15	2	20	6	6
3 00 414112	5	25	40	2	1	1	1	3	3	45	2	8	9	12	4	10	10	2	20	6	6
3 00 535111	5	30	00	2	1	1	1	3	3	30	0	15	10	12	3	9	14	3	20	10	10
3 00 112111	5	0	0	4	4	4	4	5	5	20	0	6	5	7	0	0	0	0	0	0	0
3 00 514111	5	20	40	2	1	1	1	5	5	20	2	8	5	8	3	0	0	0	0	0	0
3 00 313112	5	30	90	1	1	1	1	2	2	60	4	8	7	9	3	8	10	0	20	0	0
3 00 315113	5	30	120	1	1	1	1	2	2	45	5	15	9	12	4	9	14	2	25	6	6
3 00 513111	5	25	45	3	3	3	2	5	5	30	2	6	5	8	3	8	10	0	10	0	0
3 00 123111	5	0	30	3	3	3	1	5	5	15	0	0	5	9	0	0	0	0	0	0	0
3 00 334231	5	20	30	3	3	3	1	5	5	20	0	0	0	0	3	8	10	0	0	0	0
3 00 113111	5	0	0	0	0	0	2	5	5	15	0	0	0	0	0	0	0	0	0	0	0
3 00 521111	5	0	25	0	0	0	2	5	5	20	0	0	0	0	0	0	0	0	0	0	0
3 00 113121	5	0	0	7	7	7	3	5	5	10	0	0	0	0	0	0	0	0	0	0	0
3 00 211111	5	0	30	4	4	4	2	5	5	15	0	0	0	0	0	0	0	0	0	0	0
3 00 224111	5	20	70	3	1	1	1	5	5	15	6	15	5	7	3	10	15	2	10	0	0
3 00 415310	5	20	40	2	2	2	1	5	5	15	6	12	12	12	3	10	15	2	20	6	6
3 00 312111	5	0	0	3	3	3	2	5	5	15	0	0	0	0	0	0	0	0	0	0	0
3 00 314112	5	0	0	4	4	4	2	5	5	15	0	0	0	0	0	0	0	0	0	0	0
3 00 314113	5	30	60	2	1	1	1	5	5	20	3	15	0	4	0	0	0	0	0	0	0
3 00 412111	5	20	40	3	2	2	2	5	5	10	3	10	6	6	3	10	14	2	20	0	0
3 00 414111	5	20	50	3	2	2	2	5	5	10	3	10	6	6	3	10	14	2	20	0	0
3 00 525111	5	20	40	2	1	1	1	5	5	30	4	10	6	6	2	9	10	2	10	6	6

TUM-51RS ITV-3YRS + OFF AND ON

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

IMPROVED 10th VEHICLE CREW

OF BIOGRAPHIC DATA
 GRADE IF-6
 MOS 11113
 IN APNY 11113
 IN APILLRE : SYK
 CUMULAT 11113
 ANTI. COHRTATN 11113
 SUPERVISED : 11113

CREW TASKS									
CREW	SYMP	LOU	CLIMB	LIFT	CLIMB	WALK	LIFT	UPEN	GUNNER
WESP	CUMP	STAIRS	BOXES	STAIRS	BOXES	STAIRS	BOXES	STAIRS	WALK
USUAL TIME SEC	15	20	25	30	35	40	45	50	55
1 41111 3	0	0	0	0	0	0	0	0	0
1 51243 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11411 3	60	60	60	60	60	60	60	60	60
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 21511 3	0	0	0	0	0	0	0	0	0
1 41311 3	0	0	0	0	0	0	0	0	0
1 31111 3	0	0	0	0	0	0	0	0	0
1 41311 3	0	0	0	0	0	0	0	0	0
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 41412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11211 3	0	0	0	0	0	0	0	0	0
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31312 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31513 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 51511 3	30	30	30	30	30	30	30	30	30
1 21111 3	0	0	0	0	0	0	0	0	0
1 31211 3	0	0	0	0	0	0	0	0	0
1 31211 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 51111 3	0	0	0	0	0	0	0	0	0
1 11311 3	0	0	0	0	0	0	0	0	0
1 51111 3	60	60	60	60	60	60	60	60	60
1 21111 3	0	0	0	0	0	0	0	0	0
1 22411 3	0	0	0	0	0	0	0	0	0
1 41511 3	0	0	0	0	0	0	0	0	0
1 31412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 41211 3	30	30	30	30	30	30	30	30	30
1 52511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11112 3	0	0	0	0	0	0	0	0	0
1 21211 3	0	0	0	0	0	0	0	0	0
1 11212 3	20	20	20	20	20	20	20	20	20
1 11213 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11113 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11313 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 21412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31411 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 21413 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11413 3	-1	-1	-1	-1	-1	-1	-1	-1	-1

CREW TASKS									
CREW	SYMP	LOU	CLIMB	LIFT	CLIMB	WALK	LIFT	UPEN	GUNNER
WESP	CUMP	STAIRS	BOXES	STAIRS	BOXES	STAIRS	BOXES	STAIRS	WALK
USUAL TIME SEC	15	20	25	30	35	40	45	50	55
1 41111 3	0	0	0	0	0	0	0	0	0
1 51243 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11411 3	60	60	60	60	60	60	60	60	60
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 21511 3	0	0	0	0	0	0	0	0	0
1 41311 3	0	0	0	0	0	0	0	0	0
1 31111 3	0	0	0	0	0	0	0	0	0
1 41311 3	0	0	0	0	0	0	0	0	0
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 41412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11211 3	0	0	0	0	0	0	0	0	0
1 51511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31312 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31513 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 51511 3	30	30	30	30	30	30	30	30	30
1 21111 3	0	0	0	0	0	0	0	0	0
1 31211 3	0	0	0	0	0	0	0	0	0
1 31211 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 51111 3	0	0	0	0	0	0	0	0	0
1 11311 3	0	0	0	0	0	0	0	0	0
1 51111 3	60	60	60	60	60	60	60	60	60
1 21111 3	0	0	0	0	0	0	0	0	0
1 22411 3	0	0	0	0	0	0	0	0	0
1 41511 3	0	0	0	0	0	0	0	0	0
1 31412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 41211 3	30	30	30	30	30	30	30	30	30
1 52511 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11112 3	0	0	0	0	0	0	0	0	0
1 21211 3	0	0	0	0	0	0	0	0	0
1 11212 3	20	20	20	20	20	20	20	20	20
1 11213 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11113 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11313 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 21412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 31411 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 21413 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11412 3	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 11413 3	-1	-1	-1	-1	-1	-1	-1	-1	-1

IMPROVED IN-VEHICLE CREW

WISCONSIN : 250

CHEM TASKS

CURRENT TASKS

Crew	Stmp	Cm	Climb	Lift	Climb	Walk	Lift	Upen	Lack	Self-Stimulated Values		Squad Leader		Winner		Dr	Laden		Winner	Target Tracking Accuracy
										Stamps	Comp	Stamps	Comp	Stamps	Comp		Stamps	Comp		
1	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
2	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
3	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
4	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
5	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
6	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
7	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
8	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
9	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
10	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
11	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
12	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
13	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
14	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
15	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
16	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
17	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
18	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
19	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
20	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
21	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
22	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
23	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
24	2	41111	4	10	20	15	4	35	4	2	4	2	17	7	20	00	60	903		
25	2	41111	4	10																

OPERATING AS AN ANTI-TANK PLY SGT. TAKING CARE OF THE WELL FAIR OF 40 MEN. ALL 12 ITV AND ONE APC. ALSO MAKING SURE MY PLY. IS
TRAINER AND PREPARE FOR COMBAT. ALSO TRAINING I.I.'S WHO WORK AS PLY. LEADERS.

SECRET

NUJ12FNV154N : 20

СМЕРЬ НАС

APPENDIX TASKS

[illegible]

RENU INCLUDE ABOVE USUAL TIME
-15CANNON 00 11 AT ALL
9990END MEPLY
9END MEPLY (FOR CONFIDENCE)

IMPROVED 10M VEHICLE CREW

OFFICER/PHOTO DATA
NAME :
DOB :
YR :
MO :
DAY :
TIME :
GRADE :
HUS :
IN ARMY :
IN ARTILLERY :
COMBAT :
ARTIL. COMBAT :
SUPERVISED : 20

SQUAD LEADER :
GUNNER :
LOADER :
DRIVER :
CREW :
SUPERVISED : 20

CREW TASKS

ORDINARY TASKS

CREW	SYMP	LOW	CLIMB	LEFT	CLIMB	WALK	LEFT	UP	OPEN
RESP	COMP	STAIRS	BOXES	STAIRS	BOXES	STAIRS	BOXES	STAIRS	BOXES
USUAL TIME, SEC	15	20	25	30	35	40	45	50	55
4 12 411111	4	16	27	3	20	3	20	3	20
4 12 515431	3	11	21	1	11	1	11	1	11
4 12 114111	4	10	120	1	10	1	10	1	10
4 12 515311	3	11	21	1	11	1	11	1	11
4 12 215311	3	10	45	2	20	2	20	2	20
4 12 415111	3	20	25	3	20	3	20	3	20
4 12 311111	3	20	25	2	15	2	15	2	15
4 12 313111	3	25	30	2	12	2	12	2	12
4 12 515263	3	0	0	1	1	1	1	1	1
4 12 414112	3	1	1	1	1	1	1	1	1
4 12 335111	3	1	1	1	1	1	1	1	1
4 12 112111	3	30	40	3	15	3	15	3	15
4 12 514111	3	45	60	1	10	1	10	1	10
4 12 315112	3	1	1	1	1	1	1	1	1
4 12 315113	3	1	1	1	1	1	1	1	1
4 12 515111	3	30	40	2	15	2	15	2	15
4 12 125111	4	0	0	3	25	3	25	3	25
4 12 334231	3	30	40	2	10	2	10	2	10
4 12 113111	4	0	0	3	25	3	25	3	25
4 12 521111	3	17	25	3	20	3	20	3	20
4 12 115121	4	0	0	3	20	3	20	3	20
4 12 224111	3	19	24	3	15	3	15	3	15
4 12 415314	3	30	40	1	10	1	10	1	10
4 12 512111	3	30	40	1	10	1	10	1	10
4 12 314112	3	1	1	1	1	1	1	1	1
4 12 314113	3	1	100	1	10	1	10	1	10
4 12 412111	4	20	25	2	15	2	15	2	15
4 12 414111	3	30	40	1	1	1	1	1	1
4 12 525111	3	1	1	1	1	1	1	1	1
4 12 111121	4	0	0	3	25	3	25	3	25
4 12 112121	4	0	0	3	25	3	25	3	25
4 12 112131	4	30	40	2	20	2	20	2	20
4 12 111151	3	20	25	2	15	2	15	2	15
4 12 113151	3	25	30	2	10	2	10	2	10
4 12 214112	3	30	40	1	7	1	7	1	7
4 12 514111	3	20	30	1	8	1	8	1	8
4 12 214113	3	30	40	1	10	1	10	1	10
4 12 114112	3	25	30	1	5	1	5	1	5

CONFIDENCE = 4

SQUAD LEADER	UNTER	DR	LOADER	GUNNER	GUINER	GUINER
DESTG	CD	SEI	ARM	STARI	MELOAD	HEADY
IGI	DRIVER	PREC	ARM	DRIVE	RACK	
AZ		SLEM	PINE	STOP		
4	2	17	7	20	60	60
6	0	21	9	110	66	66
20	0	1	1	26	100	120
30	0	34	10	34	1	1
6	0	84	16	22	72	76
6	0	24	12	0	70	70
0	0	21	10	0	0	0
0	0	21	11	0	70	70
0	0	21	11	200	1	1
0	0	68	28	29	1	1
14	0	115	60	60	1	1
6	0	20	10	0	69	70
10	0	34	14	0	120	120
0	0	68	28	30	1	1
12	12	170	70	80	1	1
0	0	29	19	0	80	80
0	0	0	0	0	0	0
0	0	24	14	0	78	78
0	0	0	0	0	0	0
0	0	20	10	0	65	65
0	0	0	0	0	0	0
0	0	19	9	0	64	64
0	0	34	14	30	120	120
0	0	170	70	60	1	1
0	0	34	14	0	80	80
4	4	48	21	30	1	1
0	0	0	0	0	70	70
4	4	34	14	25	85	85
6	6	68	28	40	1	1
0	0	0	0	0	0	0
0	0	20	10	0	65	65
0	0	0	0	0	0	0
0	0	24	14	0	80	80
0	0	20	10	0	70	70
0	0	34	14	28	75	75
4	4	30	14	25	80	80
0	0	24	14	0	80	80
0	0	34	14	35	120	120
4	4	68	28	28	200	200

02NO INCREASE ABOVE USUAL TIME
-15CANNOI DO IT AT ALL
99902NO REPLY
02NO REPLY (FOR CONFIDENCE)

IMPROVED TOW VEHICLE CREW

DEMOGRAPHIC DATA WHEN MAX LONG
GRADE : SQUAD LEADER : NO YN YN MO
US : GUNNER :
IN ARMY : LOADER :
IN ARTILLERY : DRIVER :
COMBAT : WHEN
ARTIL. COMPAT : SUPERVISED : 20

CREW TASKS

ORDINARY TASKS

CREW RESP	SQUAD LEADER	GUNNER	DR	LOADER	WINNER	TARGET TRACKING ACCURACY
	USING AZ	LD DRIVER	SET ERECT SLFM	START RELOAD RACK	WINNER	TARGET TRACKING ACCURACY
USUAL TIME, SEC	15	20	25	30	35	40
4 13 411111 X	30	40	50	60	70	80
4 13 515031 4	-1	-1	-1	-1	-1	-1
4 13 114111 3	-1	-1	-1	-1	-1	-1
4 13 515311 4	-1	-1	-1	-1	-1	-1
4 13 215111 3	30	40	50	60	70	80
4 13 415111 3	45	55	65	75	85	95
4 13 315111 3	30	40	50	60	70	80
4 13 515221 5	-1	-1	-1	-1	-1	-1
4 13 414112 5	-1	-1	-1	-1	-1	-1
4 13 515211 5	-1	-1	-1	-1	-1	-1
4 13 112111 4	20	30	40	50	60	70
4 13 514111 3	-1	-1	-1	-1	-1	-1
4 13 315112 5	-1	-1	-1	-1	-1	-1
4 13 515113 5	-1	-1	-1	-1	-1	-1
4 13 515111 3	-1	-1	-1	-1	-1	-1
4 13 125111 4	45	55	65	75	85	95
4 13 314231 5	-1	-1	-1	-1	-1	-1
4 13 115111 3	20	30	40	50	60	70
4 13 113121 4	-1	-1	-1	-1	-1	-1
4 13 211111 4	25	35	45	55	65	75
4 13 224111 3	-1	-1	-1	-1	-1	-1
4 13 415314 5	-1	-1	-1	-1	-1	-1
4 13 512111 3	30	40	50	60	70	80
4 13 314112 5	-1	-1	-1	-1	-1	-1
4 13 412111 4	30	40	50	60	70	80
4 13 414111 3	-1	-1	-1	-1	-1	-1
4 13 525111 5	-1	-1	-1	-1	-1	-1
4 13 111121 4	20	30	40	50	60	70
4 13 212111 4	499	599	699	799	899	999
4 13 112121 4	25	35	45	55	65	75
4 13 112131 5	-1	-1	-1	-1	-1	-1
4 13 115131 3	30	40	50	60	70	80
4 13 214112 4	-1	-1	-1	-1	-1	-1
4 13 514111 5	-1	-1	-1	-1	-1	-1
4 13 214113 5	-1	-1	-1	-1	-1	-1
4 13 114112 3	-1	-1	-1	-1	-1	-1

I AM THE MISSILE LOGISTICS NCO FOR THE TOW PROJECT. REQUESTING ARS I WAS AN ITV INSTRUCTOR AND LATER PLATOON SERGEANT IN EINOPE AND SUPERVISED APPROX 30 PERSONNEL. I HAVE ALSO BEEN AN ANTI-ARMOR INSTRUCTOR AT FT BENNING, GA. FROM 1978-79.

0=NO INCREASE ABOVE USUAL RATE
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

IMPROVED IN A VEHICLE CREW

GRADE	NAME	COMP	DATE	TIME
1ST LT	SMITH	100	100	100
2ND LT	JOHN	100	100	100
3RD LT	JOHN	100	100	100
4TH LT	JOHN	100	100	100
5TH LT	JOHN	100	100	100
6TH LT	JOHN	100	100	100
7TH LT	JOHN	100	100	100
8TH LT	JOHN	100	100	100
9TH LT	JOHN	100	100	100
10TH LT	JOHN	100	100	100
11TH LT	JOHN	100	100	100
12TH LT	JOHN	100	100	100
13TH LT	JOHN	100	100	100
14TH LT	JOHN	100	100	100
15TH LT	JOHN	100	100	100
16TH LT	JOHN	100	100	100
17TH LT	JOHN	100	100	100
18TH LT	JOHN	100	100	100
19TH LT	JOHN	100	100	100
20TH LT	JOHN	100	100	100
21ST LT	JOHN	100	100	100
22ND LT	JOHN	100	100	100
23RD LT	JOHN	100	100	100
24TH LT	JOHN	100	100	100
25TH LT	JOHN	100	100	100
26TH LT	JOHN	100	100	100
27TH LT	JOHN	100	100	100
28TH LT	JOHN	100	100	100
29TH LT	JOHN	100	100	100
30TH LT	JOHN	100	100	100
31ST LT	JOHN	100	100	100
32ND LT	JOHN	100	100	100
33RD LT	JOHN	100	100	100
34TH LT	JOHN	100	100	100
35TH LT	JOHN	100	100	100
36TH LT	JOHN	100	100	100
37TH LT	JOHN	100	100	100
38TH LT	JOHN	100	100	100
39TH LT	JOHN	100	100	100
40TH LT	JOHN	100	100	100
41ST LT	JOHN	100	100	100
42ND LT	JOHN	100	100	100
43RD LT	JOHN	100	100	100
44TH LT	JOHN	100	100	100
45TH LT	JOHN	100	100	100
46TH LT	JOHN	100	100	100
47TH LT	JOHN	100	100	100
48TH LT	JOHN	100	100	100
49TH LT	JOHN	100	100	100
50TH LT	JOHN	100	100	100
51ST LT	JOHN	100	100	100
52ND LT	JOHN	100	100	100
53RD LT	JOHN	100	100	100
54TH LT	JOHN	100	100	100
55TH LT	JOHN	100	100	100
56TH LT	JOHN	100	100	100
57TH LT	JOHN	100	100	100
58TH LT	JOHN	100	100	100
59TH LT	JOHN	100	100	100
60TH LT	JOHN	100	100	100
61ST LT	JOHN	100	100	100
62ND LT	JOHN	100	100	100
63RD LT	JOHN	100	100	100
64TH LT	JOHN	100	100	100
65TH LT	JOHN	100	100	100
66TH LT	JOHN	100	100	100
67TH LT	JOHN	100	100	100
68TH LT	JOHN	100	100	100
69TH LT	JOHN	100	100	100
70TH LT	JOHN	100	100	100
71ST LT	JOHN	100	100	100
72ND LT	JOHN	100	100	100
73RD LT	JOHN	100	100	100
74TH LT	JOHN	100	100	100
75TH LT	JOHN	100	100	100
76TH LT	JOHN	100	100	100
77TH LT	JOHN	100	100	100
78TH LT	JOHN	100	100	10

WORKING TASKS

[illegible]

CONFIDENCE = 9

[illegible]

119107 " 30 30 I 30
119108 " 30 30 I 30
119109 " 30 30 I 30
119110 " 30 30 I 30

NEW TASKS

[illegible]

292

NO INCREASE ABOVE USUAL TIME
-15CANADIAN UN IT AT ALL
99402NO REPLY (FOR CONFIDENCE)
92ND REPLY (FOR CONFIDENCE)

IMPROVED IN VEHICLE CREW

ST-A SQUAD LEADER : 75 0
MUS : 111150
IN ARMY : 111150
IN ARTILLERY : 111150
GUNNER : 111150
LOADER : 111150
DRIVER : 111150
CUNDAI : 111150
ARTIL. COMBAT : 111150
SUPERVISED : 20

CREW TASKS

ORDINARY TASKS

CREW	SYMP	CON	LIMB	LIFT	CLIMB	WALK	LIFT	UPEN	LOCK	SQUAD LEADER	GUNNER	UR	LOADER	WINNER
RESP	STAIRS	RUNES	STAIRS	STAIRS	STAIRS	STAIRS	STAIRS	STAIRS	STAIRS	LD	LD	LD	LD	LD
USUAL TIME: JFC	15	20	25	30	35	40	45	50	55	60	65	70	75	80
4 26 41111 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 26 51541 5	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 11411 4	45	45	45	45	45	45	45	45	45	0	0	0	0	0
4 26 51531 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 21311 4	30	30	30	30	30	30	30	30	30	0	0	0	0	0
4 26 41311 4	20	25	25	25	25	25	25	25	25	0	0	0	0	0
4 26 31111 4	20	25	25	25	25	25	25	25	25	0	0	0	0	0
4 26 31311 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0
4 26 51523 5	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 41412 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0
4 26 51511 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 11211 4	20	25	25	25	25	25	25	25	25	0	0	0	0	0
4 26 31411 4	45	60	60	60	60	60	60	60	60	0	0	0	0	0
4 26 31511 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 31513 4	60	80	80	80	80	80	80	80	80	0	0	0	0	0
4 26 51511 4	35	45	45	45	45	45	45	45	45	0	0	0	0	0
4 26 12511 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0
4 26 33423 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 51511 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 26 52111 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 26 11312 4	25	35	35	35	35	35	35	35	35	0	0	0	0	0
4 26 21311 4	20	25	25	25	25	25	25	25	25	0	0	0	0	0
4 26 22411 4	25	30	30	30	30	30	30	30	30	0	0	0	0	0
4 26 41514 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 31211 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0
4 26 31412 4	40	50	50	50	50	50	50	50	50	0	0	0	0	0
4 26 31413 4	40	50	50	50	50	50	50	50	50	0	0	0	0	0
4 26 41211 4	40	50	50	50	50	50	50	50	50	0	0	0	0	0
4 26 41411 4	40	50	50	50	50	50	50	50	50	0	0	0	0	0
4 26 52511 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 11121 4	20	30	30	30	30	30	30	30	30	0	0	0	0	0
4 26 21211 4	45	60	60	60	60	60	60	60	60	0	0	0	0	0
4 26 11212 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0
4 26 11213 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 11311 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0
4 26 11312 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 21412 4	50	60	60	60	60	60	60	60	60	0	0	0	0	0
4 26 31411 4	45	60	60	60	60	60	60	60	60	0	0	0	0	0
4 26 31413 4	-1	-1	-1	-1	-1	-1	-1	-1	-1	0	0	0	0	0
4 26 41413 4	40	50	50	50	50	50	50	50	50	0	0	0	0	0
4 26 11412 4	30	40	40	40	40	40	40	40	40	0	0	0	0	0

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED

NS : 0457A3F4H15#

REPLY BY AMY T. QAS

4	20	411111	3	20	30	5	45	5	20	8	25	12	0	0	75
4	20	515431	4	-1	-1	1	1	1	90	15	35	25	0	0	65
4	20	114111	4	35	00	1	1	2	40	10	30	25	-1	-1	65
4	20	515311	4	-1	-1	1	1	1	60	10	30	14	-1	-1	60
4	20	213111	4	25	35	1	1	3	60	8	25	12	180	180	65
4	20	413111	4	30	00	1	1	5	10	8	20	10	0	0	65
4	20	311111	3	30	00	1	1	5	10	8	21	10	0	0	65
4	20	313111	3	30	00	1	1	5	10	8	22	14	0	0	65
4	20	515221	4	60	60	2	2	2	60	15	60	60	-1	-1	999
4	20	414112	4	60	60	1	1	2	60	10	30	25	-1	-1	999
4	20	515111	4	60	60	1	1	2	15	15	35	15	0	0	60
4	20	112111	4	20	25	1	1	3	10	8	21	10	-1	-1	65
4	20	514111	4	20	25	1	1	3	10	8	25	10	-1	-1	60
4	20	313112	4	20	25	1	1	2	10	8	30	14	-1	-1	65
4	20	315113	4	20	25	2	2	1	10	6	30	14	0	0	999
4	20	513111	4	20	25	1	1	2	10	10	20	10	-1	-1	60
4	20	123111	4	20	25	2	2	3	10	8	20	14	0	0	65
4	20	134231	4	30	30	1	1	2	10	8	30	14	0	0	999
4	20	113111	4	20	25	3	3	1	10	6	30	25	-1	-1	55
4	20	521111	4	20	25	4	4	1	10	0	0	0	0	0	75
4	20	113121	4	20	25	1	1	10	10	0	0	0	0	0	75
4	20	214111	4	20	25	1	1	5	10	0	0	0	0	0	70
4	20	224111	3	20	25	2	2	10	10	0	0	0	0	0	999
4	20	415214	4	35	45	1	1	4	15	8	21	10	-1	-1	50
4	20	312111	3	25	30	1	1	10	15	15	60	60	-1	-1	70
4	20	314112	3	30	30	2	2	3	10	10	14	20	0	0	65
4	20	314113	4	35	45	1	1	3	25	15	25	20	-1	-1	65
4	20	412111	4	20	25	1	1	15	10	4	35	30	-1	-1	75
4	20	414111	4	20	25	1	1	4	15	8	25	20	0	0	65
4	20	525111	4	30	40	-1	1	5	20	10	30	15	-1	-1	50
4	20	111121	4	10	22	4	4	20	10	5	20	10	-1	-1	80
4	20	212111	4	20	22	1	1	10	10	8	19	10	0	0	75
4	20	112131	4	10	22	3	3	15	10	8	20	10	0	0	80
4	20	112131	3	20	23	1	1	5	15	8	20	12	0	0	60
4	20	111131	3	20	22	1	1	10	25	8	20	10	0	0	65
4	20	113131	3	20	25	1	1	10	20	8	19				

MASSACHUSETTS

[illegible]

CMFN TASKS

ADDITIONAL TASKS

[illegible]

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED

INDEPENDENT IN A VARIOUS COUNTRIES

[illegible]

CHECK TASKS

UDUTL, BKV TASCAS

[illegible]

ALTERED BRIEFLY AS FOLLOWS FOR AN AT PLI, SECTION LUR FOR ANOTHER SHORT PERIOD OF TIME AND APPROX 6 MONTHS AS THE NCO AND
CONDUCTED A COURSE ON THE TEN COVERED WITH THE TEN AND APPROX 1/2 YEARS WORKED WITH M20 TOW FOR 2 YEARS

Appendix B

DEMOGRAPHIC DATA

This appendix contains the complete returns from the demographic data sheets at the front of each questionnaire, and is divided into two parts. The first lists the fill-in-the-blank answers to explicit questions. The second contains the essay responses to the question: "Briefly describe your military duties during the past year," plus any remarks written anywhere in the questionnaire.

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CREW 1: GUN CREW

RESP	GRADE	RANK	MOS	IN ARMY	TU	ARTIL	YR	MO	COMBAT?	WHEN	APR	CHIEF OF SECTION			WINNER			ASSIST GUNNER			LOADER			MEN SUPER-VISED
												WHEN	HOW	LONG	WHEN	HOW	LONG	WHEN	HOW	LONG	WHEN	HOW	LONG	
				YR	MO	YR	MO		WHEN	HOW	LONG	MO	YR	MO	MO	YR	MO	MO	YR	MO	MO	YR	MO	
101	F-5		13R20	3	3	N			N			10	A2	2	01			01						5
102	E-5		13P20	6	A	N			N			10	A1	1	7A	3		75	3		7A	1		5
103	F-5		13R20	3	6	N			N				A2	4	01			01			80	1		5
104	F-6		13R30	10	10	N			N				75	0										10
105	E-5		13R20	4	3	N			N				A2	1	11	00	2	1						20
106	F-5	Sgt	13R20	10	10	N			N				78	4										5
107	E-5	Sgt	13R20	5	5	N			N			10	A2	1	01			79	2		7A	1		10
108	F-5		13R45	3	10	N			N				02	4										5
109	F-6		13R3PU	12	10	N			N			70	10											10
110	E-5		13R20	6	6	N			N				3	*										10
111	F-5		13R20	4	2	N			N				1	A										20
112	F-5		13R20	3	3	N			N															5
113	E-5		13R20	6	6	N			N			79	3	4	02	1		76	2		7A	1		5
114	F-5		13R20	4	4	N			N				2	4				1						10
115	F-6		13R30	8	8	N			N			1	02	10										10
116	F-5		13R20	3	6	N			N				A2	A				01	1		79	3		2
117	F-6	ASG	13R20	2	2	N			N															2
118	F-6	SSG	13R20	10	10	N			N			7A	0					73	1		72	1		10
119	F-7	SFC	13R3C	14	11	N			N			71	9					68	1		68	1		10
120	F-6		13R3C	9	9	N			N			79	4					76	1		75	1		50
121	F-5		13R20	3	3	N			N															10
122	F-5	Sgt	13R20	3	3	N			N				1	2										10
123	F-5		13R20	13	13	N			N				5											10
124	F-5		13R20	6	6	N			N			10	A2											5
125	F-5		13R20	4	4	N			N					7				79	2					5
126	F-6		13R20	4	4	N			N															5
127	F-5		13R20	4	1	N			N					6				6	00		3	70	6	20
128	F-5		13R20	3	3	N			N			10	A2	2				9	00					5
129	E-5		13R20	4	4	N			N															5
130	F-7		13R40	16	13	N			N			72	4											10
131	F-7		13R40	15	12	N			N			75	4					69	1		68	1		>50
132	F-5		13R20	3	3	N			N															5
133	F-5		13R20	2	2	N			N															5
134	F-5		13R20	2	6	N			N			10	A2	3				01			80	1		5
135	F-5		13R20	2	6	N			N			9	A1	1	2			2	01					20
136	F-5		13R20M5	4	6	N			N															20
137	F-6		13R20	8	7	N			N			79	3	2				76	1		75	1		5
138	F-5		13R30	3	3	N			N			9	A2	2				6	01					10
139	F-6		13R20	7	7	N			N			76	5					75	3		75	4		10

CREW 1: DUTY DESCRIPTION

101 I HAVE BEEN A CHIEF OF SECTION FOR THE LAST 2 MONTHS ON 155 MM M109 AS HOW. PRIOR TO THAT I WAS A GUNNER ON M109 203MM HOW.
 102 TO SUPERVISE AND LEAD THE MEN AS IF IT WERE AN ACTUAL COMBAT SITUATION AND HOW TO PROTECT THEMSELVES AND THE EQUIPMENT AND WHAT
 TO DO IN CERTAIN SITUATIONS AND THERE JURS IN COMBAT
 103 I PLACE IN A POSITION AS GUNNER OF A SECTION LEARNING TO GUN THEN AT THE SAME TIME LEARNING TO CHIEF THE SECTION. * SOME
 104 SUPERVISE AND TRAIN THE PERSONNEL IN MY SECTION AND PATTERY, PERFORM DUTIES AS A SECTION CHIEF.
 105
 106 CHIEF OF SECTION I SUPERVISED AN GTVF TRAINING TO MY SECTION.
 107 I HAVE TO SUPERVISE MY PEOPLE IN THE MORNING, WHICH IS 7 PEOPLE, IN CLEANING UP THEIR ROOM AND GETTING READY FOR THE JOB. I HAVE
 A M10A2 HOWITZER, A TUCH, THAT I HAVE TO MAKE SURE THE PROPER PREVENTIVE MAINTENANCE + CHECKS AND SERVICES ARE DONE. I HAVE TO
 BE ACCOUNTABLE FOR MY TOOLS AND SERVICABILITY
 108 I HAVE BEEN A ASSEMBLER IN SPECIAL WEAPON FOR LAST YEAR
 109 AS CHIEF OF SECTION MY DUTIES HAS BEEN TO TRAIN MY MEN TO DO THEIR ASSIGN TASK SO THAT THE UNIT MAY DO ITS MISSION
 ALSO TO TRAIN THEM IN THE BEST MEANS POSSIBLE IN THEIR ASSIGN MDS.
 110 I AM A CHIEF OF SECTION OF 155 SP. M109A2 AND THAT IS WHAT I HAVE. UOHT AND SUGERT IRATNA SUDIER. * C 3/18FA
 111 CHIEF OF SECTION + SPECIAL WEAPONS TEAM CHIEF, SUPERVISING A 10 MAN GUN CREW + A 4 MAN SPECIAL WPNS. TEAM.
 112 I'VE BEEN A 13R ALL OF MY ARMY CAREER. I'VE ALSO IN SPECIAL WEAPONS AND HAVE BEEN FOR THE PAST 3 YEARS.
 113 DURING THE PAST YEAR I HAVE BEEN THE CHIEF OF A M103A3S.P. AND HAV - HAD ANYWHERE FROM 3 TO 8 MEN WORKING FOR ME.
 114
 115 SUPERVISING THE PEOPLE IN MY SECTION, KEEPING A SAFE GUN
 116 HAS BEEN SECTION CHIEF SINCE 1982
 117 I HAVE BEEN A NUCLEAR ASSEMBLER AND READER ON THE SPECIAL WEAPONS SECTION (A- HOWT.) ALSO I BEEN BTRY MRC P20, AND ALTERNATE
 ENLISTED MRC MCO.
 118 DETACHMENT SGT. OPERATIONS MCO, GUNNERY SGT. CHIEF OF SECTION, RE-ENLISTMENT MCO.
 119 MY DUTIES WERE MRC MCO IN GERMANY AND SECURITY STIF MCO ALONG W/GERMAN SOLDIER'S CUSTODIAL GUARDS FOR 155 NUKE RD. TRANSFER WERE
 TO FT. STILL BECAME CHIEF FIRING BTRY FOR 241PH. A VIETNAM
 120 SUPERVISE THE MAINTENANCE AND ACCOUNTABILITY OF SEC. EQUIP AND TRAINING OF PERSONNEL BOTH INDIVIDUAL AND COLLECTIVE TRAINING.
 SUPPORT AND ENCOURAGE CAREER DEVELOPMENT OF SUBORDINATE SOLDIERS.
 121 DURING THE PAST YEAR I HAVE BEEN ANNO SECTION CHIEF AND HOWITZER SECTION CHIEF
 122 I WAS AN ASSEMBLER ON THE 155 SYSTEM IN NORTHERN GREECE. I WAS AT THE 14TH USAFAD-1 PCS'ED TO FT. SILL WHERE I AM NOW A GUNNER
 ON A SECTION * OFF AND ON
 123 BEEN ASS. GUNNER AND #1 MAN THEN WENT TO CHIEF OF SECTION OF ANNO.
 124 I HAVEN'T REALLY HAD ANY. MOST OF THE TIMES THIS PAST YEAR I HAVE BEEN MOVED AROUND A LOT.
 125 MY MILITARY DUTIES DURING THE PAST YEAR WAS AN ANNO AGENT RESPONSIBLE WHAT TO PICK UP AND DIVERLY AMMO TO ALL THE BATTERY IN THE
 RD.
 126 SECTION CHIEF 155MM SP, GUNNERY SGT, AMMO P/L. FT. SILL * AT THE AGE OF 18 * VIETNAM
 127 I WAS A GUNNER IN A TROOP UNIT IN GERMANY AND THEN IN FEBRUARY 1982 I PCS TO FT. SILL AND I WAS A GUNNER UNTIL 2 JUNE 1982 THEN
 I BECAME SECTION CHIEF ON A 155MM HOWITZER
 128 GUNNER, SECTION CHIEF * 2 MONTHS
 129 HOME * 5 MONTH
 130 I WAS ASSIGNED AS 1SG OF A 155 MM HOW BATTERY C-BTRY 2/37 FT. SILL OK. 1/503
 131 CHIEF OF FIRING BTRY. SUPERVISE AND TRAIN CHIEF OF SECTION IN RE LEADER, TO DEVELOPED THE YOUNG SOLDIER OF TOMMORROW, HOW TO
 SUPVISE IN COMBAT.
 132 A YEAR AGO I WAS STATIONED IN TURKEY. ALL OF MY DUTIES THERE WERE SPECIAL WEAPONS RELATED. I WAS ASSIGNED HERE THE END OF JUNE.
 * OCCASIONALLY
 133 I HAVE BEEN A OPERATION OF AN 155 SP HOWITZER AS WELL AS A GUNNER AND CHIEF OF SECTION I ALSO SERVED IN WEST GERMANY FOR
 2 YEARS.
 134 SECTION CHIEF, MRC MCOIC FOR 3/18 FA A BTRY, I HAVE BEEN WITH 3/18 FOR 2 1/2 YRS AND HAVE WORKED WITH NBC, AND OTHER MAJOR
 SCHOOLS.
 135 I WAS IN AN ANNO SECTION LEADING A 5-TON TRUCK AND LARRYING OUT NORMAL DUTIES, SINCE I MADE E-5 4 MONTHS AGO I AM AN ANNO AGENT.
 MAKING SURE THE FIRING BATTERIES GET AMMO. FT. SILL IS THE ONLY PLACE I'VE BEEN SINCE IN THE ARMY AND HAVE NEVER BEEN ON A GUN.
 136 CBR, AND SPECIAL WEAPONS, ATTENDED BNCOC/CA
 137 RW. AMMO SGT. HERE AT FT. SILL
 138 KUPKA RD-81, MARCH/ ARMY TANKS 90, I WAS PROMOTED TO CPL. FROM PFC ON JUNE 81. PNCOC AUG 81, BNCOC OCT. 81, GUNNER FT. RILEY KA.
 139 NOV. 81, CHIEF OF SECTION SEPT. 82, OCT. 82 SGT. INSURUCION
 * NOT 155 BUT M10A2 8-INCH
 139 SECTION CHIEF ON 155 SP, ANNO-CA STUDENT, S W CHIEF, SECTION CHIEF ON 155 SP

CREW 2: FDC CREW

RESP	GRADE	RANK	MUS	IN	ARMY	IN	ADITL	FUNDAT?	ARI	FUC	COMPUTER	WHEN	HOW	LONG	MO	YR	MO	YR	MO	MEN
201 F-7	13C4T			15		6	Y	70	72	N						10	82			10
202 F-7	13F			2	0	9	N									10				10
203 F-7	13F10	SP4		2	0	4	N									10				10
204 F-7	13F10			5	2	5	N									5				5
205 F-7	13F			2	0	2	N									5				5
206 F-7	F.D.SPEL			10		6	N									5				5
207 F-7	13C			6	0	2	N									5				5
208 F-7	13F	SP4		2	0	6	N									5				5
209 F-7	13F10			2	0	2	N									5				5
210 F-7	13C30			5	0	5	N									5				5
211 F-7	13F10			1	0	1	N									10				10
212 F-7	13F20			3	0	3	N									5				5
213 F-7	13C20			4	0	4	N									5				5
214 F-7	13C30			13	0	7	N									10				10
215 F-7	13C10			5	0	2	N									5				5
216 F-7	13C20			5	0	0	N									10				10
217 F-7	13F30			8	0	0	N									5				5
218 F-7	SFC			16		10	N									10				10
219 F-7	SP4			7		11	N									2				2
220 F-7	13C10			4		4	N									>50				>50
221 F-7	13F			10		1	N									10				10
222 F-7	13C20			5	0	5	N									5				5
223 F-7	ASC			2		2	N									5				5
224 F-7	SP4			2		2	N									5				5
225 F-7	SP4			2	1	2	N									5				5
226 F-7	13F10			12	0	0	N									5				5
227 F-7	13F30			1		5	N									10				10
228 F-7	SSC			13		13	N									>50				>50
229 F-7	13F4M			2	6	2	N									2				2
230 F-7	13F	SP4		2	0	2	N									5				5
231 F-7	13F10			2	0	2	N									5				5
232 F-7	13F10			1	1	1	N									5				5
233 F-7	13F			1		1	N									5				5
234 F-7	13F			3		3	N									5				5
235 F-7	13F			4	0	0	N									5				5
236 F-7	SP4			2	0	2	N									5				5
237 F-7	13F10			3	0	3	N									10				10
238 F-7	PFC			2	0	2	N									>50				>50
239 F-7	13F10			2	0	2	N									2				2

CREW 2: DUTY DESCRIPTION

- 201 RECLASSIFIED INTO ARTILLERY: MY DUTIES AS FDC NCOIC OF A BRIGADE TACFIRE. SUPPORT OF AN ARTILLERY
- 202 FINISHED ALL IN JULY WHEN WITH MY PRESENT UNIT APPROX. 4 MONTHS WORKED AS RIO IN UNTIL NOW.
- 203 POLICE CALL, FORMATION, PULLING GUARD-SAT NATION GUARD MOTOR POOL GUARD, VEHICLE MAINT. DRILL AND CEREMONY, SGT TEST, P.T.
- 204 TEST- MGS WORK. * LAST 7 MONTHS
- 205 WORKED IN BATTALION FDC AS A BATTERY COMPUTER. PRESENTLY JUST COMPLETED A STANCE OF ACTING SECTION CHIEF AND PRESENTLY A BATTERY
- 206 COMPUTER IN A BATTERY FDC.
- 207 DICTION. OF FIRE FOR BATTALION. MAINTENANCE: SECTION. EQUIPMENT-VEHICLES: PHYSICAL ENVIRONMENT; CHITIC GRASS, SWEEPING ASPHALT
- 208 STATING OUT OF LEGAL/FINANCIAL TROUBLES
- 209 I'VE WORKED ON CHARTS, DRIVE THE 577 VEHICLE THAT WE TAKE OUT ON FIELD MISSIONS, AND I'VE BEEN THE RIO OR MOTO TRANSMITTER
- 210 OPERATOR.
- 211 TACTIC COMPUTER SPECIALIST, ASST SECTION CHIEF, OVERSEES MAINT ON ALL VEHICLES RELATED TO TACFIRE UNIT, AND TRAINING ON ALL
- 212 SECTION PERSONNEL
- 213 FDC RELATED DUTIES AS NCO VCO COMPUTER, NBC ASSISTANT.
- 214 MY UNIT AS A FDC MEN HAVE RANGED ANYWHERE FROM 577A1 (TRACK) MAINTENANCE TO COMPUTER; RIO; FDC HCU, FDC VCO, TO CHEMICAL SURVEY
- 215 TEAM. * OFF AND ON
- 216 IN THE PAST YEAR I HAVE SUPERVISED THE OPERATION OF THE BTRY FDC AND BOC, WHILE ALSO OPERATING AS THE CHIEF COMPUTER.
- 217 1) BE AT APPOINTED PLACE OF DUTY ON TIME 2) TO WORK IN THE 13E10 MOS. 3) PULL C.O. 4) WORK ON DETAILS 5) * 3 DAYS
- 218 I'M PRIOR SERVICE AND CAME IN A DIFFERENT MOS, LAST WAS 15D10. I'VE BEEN WORKING MY PRESENT MOS A LITTLE OVER A YEAR AND CAME
- 219 TO OF COMPUTER.
- 220 I HAVE BEEN TACTIC OPERATION SPECIALIST, ALSO AS ADDITIONAL DUTY I HAVE BEEN IN SCHOOL, A R AND THE NCO. * ALTERNATED
- 221 FOR THE LAST YEAR I HAVE ACTED AS FIRE CONTROL NCO AND SUPERVISED ALL PERSONNEL THAT WORKS UNDER ME.
- 222 SUPPORTING ON FDC IN TARGETING AND ACCURACY OF LANDING A ROUND ON TARGET/ HE / NUC AND VARIOUS COMBINATIONS OF ROUNDS. VOICE AND
- 223 COMMAND OPERATIONS FOR ENCRYPT MESSAGES.
- 224 HEAVY MAINTENANCE ON VEHICLES, TRAINING FOR AN ARTIF, SUPPORTING STR POWER UP THE SHELTER, MAINTAIN HE CCU, SET UP, TURN DOWN
- 225 THE NET? MAINTAIN 5 ION GENERATOR. * YES
- 226 RUF NUCLEAR SUPPLY NCO. HELP MY RUF NUCLEAR UNITS TO PASS NSAV, NSI, IPI, IVI'S.
- 227 CURRENTLY WORKING AS BN FDC CHIEF IN A TACFIRE UNIT. I WAS MANUAL FDC 14 YRS PREVIOUS TO THIS. HAVE WORK EVERY LEVEL FROM BTRY
- 228 TO DIVARTY USUALLY AS CHIEF OF FDC.
- 229 I WORKED WITH TACFIRE AND VENE I AM NOT IN A POSITION TO SUPERVISE OR WORK WITH MANUAL FDC. I HAVE WORKED AS AN RIO AND GEN
- 230 MOVE.
- 231 I HAVE BEEN A SUPERVISOR FOR A FDC SECTION FOR THE PAST YEAR
- 232 WORKING IN S-3 TRAINING SECTION AS PAPER-PUSHER. FIELD ONLY AS TACFIRE VENE OPERATOR, ALSO M577 COMMAND POST DRIVER.
- 233 I HAVE BEEN SECTION CHIEF IN FDC FOR 4 MONTHS AND BEFORE THAT I WAS THE CHIEF COMPUTER
- 234 WORKING IN FDC IN KOREA AND THE USA. USING BOTH THE 19A AND 109A3 HOWITZERS. I HAVE LATELY BEEN WORKING AS COMPUTER FOR C 2/3. FA
- 235 DURING FTA'S AND ALSO WAS COMPUTER DURING KNA25 SMOKE TEST FOR THE U.S. ARMY FIELD ARTILLERY BOARD.
- 236 I WORKED IN AN FDC SECTION UNTIL I RECEIVED A PROMOTION. PROFILE, KEEPING ME FROM GOING TO THE FIELD. NOW I AM WORKING AS CLERK/
- 237 TYPIST IN THE S-3 SECTION.
- 238 MOS NCO AND ORDERLY ROOM CLERK PRIOR TO TAKING OVER FDC SECTION
- 239 FDC CHIEF/SIP NCO/A & P NCO AND CCC NCO. MY TIME IS SPENT IN ONE OF THESE AREA'S ALMOST ALL OF THE TIME! * 6-8 MONTHS
- 240 NOV 81-SEP 82 HON 1SG FEB 82-NOV 82 OPH SGT
- 241 OPERATIONS SPECIALIST AT FORT SILL, IN GERMANY I WAS A CHART OPERATOR, COMPUTER, AND TRACK DRIVER
- 242 I WAS SECTION CHIEF. I FOLLOWED OR LOOKED OVER AND TAUGHT MY MEN THE CORRECT WAYS TO COMPUTE DATA AND I FIGURED DATA FOR ALL
- 243 TYPE OF ROUNDS WITH A 109A3 FIRING BATTERY.
- 244 CLERK (ARMO AND TRAINING AND USG ASST) TRAINING SCHEDULES AND ARMO FORECASTING AND RECORDS FOR THE NDE. (ACTIVELY INVOLVED IN
- 245 TACTIC NET TRAINING)...
- 246 CLERK- 30-FUR
- 247 RESPONSIBLE FOR THE SUPERVISION, TRAINING AND THE FUNCTION OF THE FDC
- 248 CHART OPERATOR TROOP OVER SEER WHEN CHIEF IS NOT AROUND
- 249 WELL FOR THE LAST 7 MONTHS I HAVE BEEN LEARNING AND STUDYING TACFIRE
- 250 HAVE BEEN TRAINING IN DESERT WARFARE AND TACFIRE. AND HAVE BEEN SUPPORTING THE OFFICER'S ADVANCED TRAINING COURSE, WITH MY EQUIP
- 251 WELL HERE AT FORT SILL. I HAVE HAD VERY LITTLE TRAINING IN MY MOS 13E10, LUCKY I WENT TO GERMANY AFTER BASIC, BUT I'VE BEEN
- 252 DURING PRIMARY CHART OPERATOR ANYTIME WE'RE IN THE FIELD HERE AND WEIS.

CREW 3: TANK CREW

RESP	GRADE	RANK	MOS	IN		TR	COMBAT?	TANK	IANK		GUNNER		LOADER		DRIVER		MEN
				ARMY	NAVY				WHEN	HOW	WHEN	HOW	WHEN	HOW	WHEN	HOW	
301	F-6	19F3X	6	A		N	N										20
302	F-6	19F3X	14	S		N	N										20
303	E-6	19F3XBR	6	A		N	N										>50
304	E-6	SSG 19F	7	7		N	N										>50
305	F-6	SSG 19F3P	13	10		N	N										>50
306	F-6	SSG 19F30LS	9	9		N	N										>50
307	F-6	19F30S	8	A		N	N										>50
308	F-7	SFC 19F4YBR	13	7		N	N										10
309	F-6	19F	9	5		N	N										>50
310	F-6	19F30	6	A		N	N										>50
311	F-6	19F30	10	10		N	N										20
312	F-6	SSG 19F	9	9		N	N										>50
313	F-6	19F30	10	10		N	N										20
314	F-6	19F30S	9	9		N	N										>50
315	F-6	19F30	8	A		N	N										20
316	F-6	19F30	7	7		N	N										50
317	F-6	SSG 19F	8	8		N	N										>50
318	F-7	19F4H	13	6		N	N										20
319	F-6	SSG 19F30S	9	9		N	N										50
320	F-6	19F30BR	10	10		N	N										>50
321	F-6	SSG 19F30	11	11		N	N										20
322	F-7	19F40BR	12	5		N	N										>50
323	F-6	19F30	11	11		N	N										>50
324	F-6	19F	8	9		N	N										>50
325	F-6	19F30BR	11	10		N	N										>50
326	F-6	SSG 1811	6	6		N	N										20
327	F-6	19F30	10	10		N	N										50
328	F-6	19F30	10	10		N	N										>50
329	F-6	P 19F30H	12	10		N	N										20
330	F-6	19F30	10	10		N	N										>50
331	E-7	SFC 19F4A	14	10		N	N										>50
332	F-6	SSG 19F30	8	8		N	N										20
333	F-6	SSG 19F3	9	9		N	N										>50
334	F-6	SSG 19F3	11	11		N	N										50
335	F-6	SSG 19F30X	3	5		N	N										>50
336	F-6	SSG 19F	10	10		N	N										>50
337	F-6	SSG 19F30	11	11		N	N										50
338	F-7	19K40	11	11		N	N										>50
339	F-6	19F30	10	10		N	N										>50
340	F-7	SGT 1811	11	11		N	N										20
341	F-6	19F	10	10		N	N										>50
342	F-7	CSC 1811	13	11		N	N										>50
343	F-6	SSG 19F3XBR	10	10		N	N										50
344	F-6	19F3X	6	6		N	N										20

CREW 3: DUTY DESCRIPTION

301 D.S. * YES
 302 DRILL SERGEANT
 303 INSTRUCTOR (DRILL SERGEANT SCHOOL) TAC NCO (PRIMARY NCO COURSE)
 304 DRILL SERGEANT IN AN USUT RDE
 305 TANK COMMANDER, PLATOON SERGEANT
 306 PLATOON SGT OVER 10 PERSONNEL ALSO COMPANY MASTER GUNNER
 307 I AM THE BATTALION MASTER GUNNER. I COORDINATE ALL TANK GUNNERY AND OBSERVE TURRET MAINTENANCE.
 308 DRILL SGT.-SUPERVISOR AND TRAIN YOUNG CIVILIANS IN RECRUIT ARMOR CREWMAN. * OFF AND ON
 309 DRILL SERGEANT AT FT KNOX
 310 TANK CHUR, SUPERVISOR OF 3-20 PEOPLE AND TANK OVER AS PLT SERGEANT
 311 PLT SGT.- MAINTAIN 5 MAVAL TANKS WITH A PLT OF APPROX 20 CREW MEMBERS.
 312 DRILL SGT.
 313 CAV. TANK SECTION SGT., TANK COMMANDER
 314 TANK PLT SGT/ MASTER GUNNER FOR AN ARMOR TANK UNIT
 315 TANK PLT SGT AND MASTER GUNNER FOR MY COMPANY
 316 IN CHARGE OF A TANK PLATOON, RESPONSIBLE FOR MAINT OF VEHICLES, TRAINING AND WELFARE OF PERSONNEL
 317 PLT SGT, SECTION SGT TANK COMMANDER
 318 INSTRUCTOR AT AN NCO ACADEMY. INSTRUCT BASIC NON COMMISSIONED OFFICERS COURSE 19ECMF.
 319 P/T SERGEANT 6 MONTHS, BN MASTER GUNNER 4 MONTHS
 320 I HAVE SERVED AS PLATOON SGT. FOR THE LAST YEAR. CONTROLLING AND SUPERVISING 20-24 MEN BOTH IN GARRISON AND THE FIELD IN ADDITION I ALSO TEACH THEM ON SUT TASK.
 321 PLATOON SGT. OF A TANK PLATOON IN EUROPE.
 322 PLT SGT/PLT LDR. RESPONSIBLE FOR THE TRAINING OF 10 S.M., AND IDENTIFYING TRAINING DEFICIENCIES, AND TAKING STEPS TO CORRECT THESE DEFICIENCIES. * DEC 66 - JUL 67
 323 I HAVE BEEN TRAINING ATT/OUT TROOPS AND I AM NOW TRAINING ARMOR OFFICER BASIC.
 324 PLT SERGEANT
 325 PLATOON SERGEANT IN A CAV PLATOON, PERFORMING OUTPOST AND PATROL DUTY ALONG THE IRON CURTAIN. * ALSO 1971
 326 PLT. SGT./TANK SECTION LDR. USMC
 327 IVE BEEN A TANK COMMANDER, PLT SGT. WHEN THUR 3 GUNNERS, ARTIF AND NUMEROUS OTHER DUTIES, AND MISSIONS.
 328 ANTIFED ALL NATU FORCES ON UPON VEH. AND PERFORMED MAINTENANCE ON T42, T-62-A, T54, T54B, PT76, PT152, PT160PR, GAZ-69 AND BMP. TANK SEC. LEADER.
 329 WAS IN GERMANY IN 2BN 41 ARMOR. ENLARGED FRG WAS A PLATOON SERGEANT FOR 10 ENTIRE IFAR.
 330 INSTRUCTOR MAVAL 4FT TEAM TEACHING FIRE CONTROL, LASTING ABILITY OF A-3 SYSTEM
 331 DURING THE PAST YEAR TECH INTEL ANALYST SOVIET ARMOR
 332 TANK SECTION LEADER IN A CAV TROOP. SUPERVISE TANK SECTION AND 20 PEOPLE, LEAD TANK SECTION IN MANUEVERS AND GUNNERY EXERCISES.
 333 PLATOON SERGEANT OF A 30 MAN TANK PLATOON WITH 7 TANKS SUPPORTING THE TRAINING GIVEN AT THE U.S. ARMY ARMOR SCHOOL FT. KNOX, KY.
 334 I HAVE A PLT SGT AND A MA PLT SGT
 335 PLT SGT IN A ARMOR BN IN WEST GERMANY
 336 PLT SGT IN A ARMOR CAVALRY
 337 PLT SGT ARMORED CAV PLT. SUPERVISED MAINT OF 5 M113A1 4 M60A1 TRAINING OF ROTH 19D AND 19E E-6 AND BELOW
 338 PLT SGT/ MASTER GUNNER OF M-1 TANK PLT.
 339 TANK COMMANDER WITH A CREW OF 8. ALSO, BEING THE MAINTAINING E-6, I WAS FULFILLING THE JOB AS ASSISTANCE PLATOON SERGEANT ALSO.
 340 LOGISTICS CHIEF, TANK PLT SGT, GUNNERY AND TACTICS INSTRUCTOR, 25 MM CHAINGUN INSTRUCTOR, COMPANY TANK LDR, USMC
 341 I HAVE BEEN AN ARMOR DRILL SGT. I HAVE BEEN TEACHING BASIC SKILLS AND ARMOR SUBJECTS.
 342 PLATOON COMMANDER TANK PLATOON STATIONED OKINAWA, JAPAN AND REPUBLIC OF KOREA AND PHILIPPINES. USMC
 343 DRILL SGT TRAINING BASIC AND ATT SOLDIERS.
 344 DRILL SERGEANT

CREW 4: TOW CREW

RESP	GRADE	RANK	MOS	IN ARMY	TN	COMBAT?	ATCM	SHOOT	WINNER	LOADER	DRIVER	MEN
				YR	MO	WHEN	WHEN	WHEN	WHEN	WHEN	WHEN	WHEN
401	F-6	SSC	11M3	10	5	Y 67 6A	N	78 2	2 *	2 *	2 *	>50
402	F-6	SSC	11M3	14	11	N	N	77 5	2	2	3	>50
403	F-6	SSC	11M3	10	10	N	N	77 5	2	2	1	10
404	F-6	SSC	11M3	10	10	N	N	75 8	2	2	1	50
405	F-6	SSC	11M3	10	10	N	N	78 3	3	3	1	>50
406	F-6	SSC	11M3	14	6	N	N	1 43 6	2	2	1	50
407	F-6	SSC	11M3	10	8	N	N	79 2	2	2	1	20
408	F-6	SSC	11M3	13	6	Y 69 70	N	78 1	1	1	1	20
409	F-6	SSC	11M3	10	8	Y 68 70	N	68 6	1	1	1	20
410	F-6	SSC	11M3	17	17	Y 66 67	N	68 6	1	1	1	>50
411	F-6	SSC	11M	11	7	N	N	76 3	3	3	1	20
412												20
413												20
414	F-6	SSC	11M3	9	9	N	N	76 1	6	6	2	20
415	F-6	SSC	11M3	8	6	N	N	78 2	2	2	2	50
416	F-6	SSC	11M3	15	6	Y 70	N	78 4	4	4	2	>50
417	F-6	SSC	11M3	12	6	N	N	6 74 3	6	6	2	>50
418	F-6	SSC	11M3	9	6	N	N	73 3	3	3	2	>50
419	F-6	SSC	11M3	12	6	N	N	12 73 3	3	3	2	>50
420	F-6	SSC	11M3	13	6	N	N	9 75 2	2	2	2	50
421	F-6	SSC	11M3	7	6	N	N	7 74 3	3	3	2	50
422	F-6	SSC	11M3	11	6	N	N	75 7	7	7	2	50
423	F-6	SSC	11M3	10	6	N	N	78 1	1	1	2	50
424	F-6	SSC	11M3	10	6	N	N	75 6	6	6	2	50
425	F-6	SSC	11M3	10	6	N	N	75 6	6	6	2	50
426	F-6	SSC	11M3	9	6	N	N	75 6	6	6	2	50
427	F-6	SSC	11M3	9	6	N	N	75 6	6	6	2	50
428	F-6	SSC	11M3	14	6	N	N	75 6	6	6	2	50
429	F-6	SSC	11M3	12	6	N	N	75 6	6	6	2	50
430	F-6	SSC	11M3	12	6	N	N	75 6	6	6	2	50
431	F-6	SSC	11M3	11	6	N	N	75 6	6	6	2	50
432	F-6	SSC	11M3	11	6	N	N	75 6	6	6	2	50
433	F-6	SSC	11M3	10	6	N	N	75 6	6	6	2	50
434	F-6	SSC	11M3	13	6	N	N	75 6	6	6	2	50
435	F-6	SSC	11M3	12	6	N	N	75 6	6	6	2	50
436	F-6	SSC	11M3	12	6	N	N	75 6	6	6	2	50
437	F-6	SSC	11M3	12	6	N	N	75 6	6	6	2	50
438	F-6	SSC	11M3	11	6	N	N	75 6	6	6	2	50
439	F-6	SSC	11M3	10	6	N	N	75 6	6	6	2	50
440	F-6	SSC	11M3	11	6	N	N	75 6	6	6	2	50
441	F-6	SSC	11M3	10	6	N	N	75 6	6	6	2	50
442	F-6	SSC	11M3	15	6	N	N	75 6	6	6	2	50
443	F-6	SSC	11M3	15	6	N	N	75 6	6	6	2	50
444	F-6	SSC	11M3	7	6	N	N	75 6	6	6	2	50
445	F-6	SSC	11M3	7	6	N	N	75 6	6	6	2	50
446	F-6	SSC	11M3	13	6	N	N	75 6	6	6	2	50

CREW 4: DUTY DESCRIPTION

- 401 TOW-5YRS 1TV-5YRS * OFF AND ON
- 402 WORK WITH M901 ITV AS A PLT. LEADER 3 YEARS WORK WITH M220 TOW CARRIER FOR 6 YEARS WORK WITH M151 TOW CARRIER FOR 2 YEARS
- 403 I HAVE BEEN IN AN ANTI ARMOR PLT, 10YRS. I HAVE WORK WITH THE JEEP 10M, THE M220 SYSTEM AND AT THE PRESENT TIME ON THE M901.
- 404 WORKING AS AN ANTI-TANK PLT SGT. TAKING CARE OF THE WELL FAIR OF 34 MEN. ALL 12 TIV AND ONE APC. ALSO MAKING SURE MY PLT. IS TRAINED AND PREPARED FOR COMBAT. ALSO TRAINING L.I.'S WHO WORK AS PLT. LEADERS.
- 405 INSPECTION ITV POSITION. BROTHER LOOSE FT. REMAINING EACH APPROX. 4 STUDENTS EVERY 3 WEEKS ON HOW TO OPERATE, MAINTAIN, SHOOT THE ITV.
- 406 DURING THE PAST YEAR I HAVE BEEN ASSIGNED AS A DRILL SGT.
- 407 I HAVE EXPERIENCE IN ALL TOW VEHICLES EXCEPT THE MULES. I'M A PLT. SGT. WORKING IN JEEPS AT THE PRESENT TIME.
- 408 AS AN INSTRUCTOR FOR PHOENIX IN THE 118 SRALES. ALL ARKA'S TIV'S PLT. SGT 2YR. EUROPE
- 409 HEAVY ANTI-ARMOR CREWMAN SUPERVISOR. CHIEF SUPERVISOR SPECIALIZING IN NIGHT OPTIC
- 410 I HAVE BEEN A SECTION SGT FOR THE LAST 10 MONTH AND OUT OF THAT TIME MY TIV'S HAVE BEEN IN SUPPORT ABOUT 5 TO 9 TIME FOR DIFFERENT THINGS AND MY TIV DON'T HAVE THAT MANY GROUPS ON THE GUN.
- 411
- 412
- 413
- 414 I WAS AT 11M IN 1973/74 AND WAS THEN RECLASSIFIED AS AN 11R BY DA. IN 1979 WHEN DA RE-ESTABLISHED THE 11H MOS, I WAS AUTOMATICALLY SCHEDULED BACK. SINCE THEN I HAVE BEEN IN A RANGER OR ON STATUS AS A DRILL SGT, SO I'M NOT YOUR BEST SOURCE OF INFORMATION
- 415 I AM THE MYSELF LOGISTICS HQ FOR THE TOW PROJECT, MEDS/DIV ARS I WAS AN ITV INSTRUCTOR AND LATER PLATOON SERGEANT IN EUROPE AND SUPERVISED APPROX TO PERSONNEL. I HAVE ALSO BEEN AN ANTI-ARMOR INSTRUCTOR AT FT BENNING, GA. FROM 1978-79.
- 416 I'M A PLT. SGT. A.T. PLAT. TIV'S A VIETNAM
- 417 PLY SGT OF AN ITV PLY. WITH 30 MEN IN TIV'S IN A EUROPEAN AREA. GUN JEEPS AND 1131 TOW CAP * VIETNAM, LAOS
- 418 ANTI SECTION. * 2 YRS 10M, 3 YRS JEEP 10M, 2 YRS TOW TRACK, 2 YRS DRAGON SMO. LDR.
- 419 2 YRS WITH THE TOW ON APC AND 3 YRS ON JEEP. I HAVE BEEN SQUAD LEADER AND SECTION LEADER.
- 420 PLY SGT ANTI TANK PLY, 6 GUNS 13 VEHICLES- ARIFP-
- 421 I'M CURRENTLY ASSIGNED AS A DRILL SGT. HERE ON FT. BENNING. THE ONLY CONTACT IVE HAD WITH THE TOW AS BEEN IN SKILL LEVEL 1 TASKS THAT I HAD TO REINFORCE WITH MY TRAINERS.
- 422 SECTION SGT RESPONSIBLE FOR A F-4 AND 2 TOW VEHICLE, PRESENT DUTY IS PLY SGT OF 12 ITV AND 51 M.
- 423 I AM CURRENTLY AN ITV SECTION LEADER IN A COMBAT UNIT. I HAVE TRAINED SOLDIERS IN ALL DIFFERENT MODE OF TOW'S. I HAVE BEEN A TOW SECTION SGT FOR THE LAST 7 YRS I HAVE ALSO BEEN AN INSTRUCTOR ON THE M220 TOW WITH THE 4TH DIV. ANTI ARMOR SCHOOL.
- 424 I HAVE BEEN A PLATOON SERGEANT M220-JEEPS WITH THE 101ST FOR THE PAST 8 MTS. I WAS A PLATOON SERGEANT HQUT WITH 3RD ARMOR DIVISION PRIOR TO DEPLOYING TO 101ST.
- 425 I AM A DRILL LEADER SGT IN EUROPE WHERE I HAVE 3 TOW TIV SECTION'S 6 TIV'S THAT I AM RESPONSIBLE TO LEAD AND TRAIN I HAVE BEEN IN THAT POSITION 1 YEAR. * 10 YEARS ACTIVE, 3 YEARS RESERVE, 11H, 10A'S ** KVM. HELICOPTER GUN GUNNER *** SECTION LEADER ON HIGHER 7A-83
- 426 HAVE SERVED AS A GROUP LEADER OF A GROUP WHICH CONSISTED OF APPROXIMATELY 21 PERSONNEL, 3 SECTIONS, 6 TOW WEAPON SYSTEMS. SYSTEMS ARE MOUNTED ON M151 A2. I HAVE USED THE TOW IN THE M113, 1/2 TON MULE, AND THE M151 1/4 TON.
- 427 I'VE WORKED WITH JEEP MOUNTED TOW AND M113 TOW, TOW CAP VEHICLE, MY PRESENT JOB IS PHIC INSTRUCTOR
- 428 IN 1975 I STARTED WITH THE GROUND MT. SYSTEM AND WORKED WITH IT MOSTLY AS A SGT. LD. AND SECTION SGT. I STARTED WITH THE ITV IN JAN 81 UNTIL NOW AS A SECTION SGT IN GERMANY
- 429 I STARTED MOUNTING IN TOW IN 1977, I DEPARTED FOR GERMANY IN 1979. THERE I WORK WITH THE ITV, I RETURNED TO FT. CAMPBELL WHERE I AM PRESENTLY SERVICING
- 430 IVE WORKED WITH THE TOW WPH SYSTEM ON A REGULAR 113, AM IMPROVED 113 THEN ON THE ITV. * 1 TIME
- 431 ORILL SERGEANT NO EXPERIENCE WITH
- 432 I WORK ON LEE RANGER AS AN INSTRUCTOR FOR ITV. * 1 WEEK
- 433 I HAVE BEEN PLY SGT OF AN AT 111 APPX TWICE IN THE PAST YR, RIGHT NOW I AM PRESENTLY A SECTION SGT OF AN ITV CREW IN CHARGE OF MAINTAIN, WEAPONS, AS WELL SUPERVISION OF MY SECTION * US NAVY
- 434 I HAVE BEEN A DRILL INSTRUCTOR AT FT UTA, N.J. WHICH IS VERY LONG HOURS AND MENTALLY VERY DIFFICULT.
- 435 TOW SECTION LDRS. GERMANY, ON MULE IN CHARGE OF ALL TOW TRAINING. TOW INSTRUCTOR IT PULK MOUNTED, 31 W, TRACK AND GUN.
- 436 * VIETNAM ** GERMANY
- 437 I TV SECTION LEADER - RESPONSIBLE FOR SUPERVISION OF 7 PEOPLE AND 2 ITVS 23 WEAPONS PLY SGT-RESPONSIBLE FOR SUPERVISION OF 81
- 438 IN HONKAP SECTION AND 1 TIV SECTION.
- 439 ORILL SERGEANT AT FT BENNY GEORGIA TRAINING TODAY'S INITIAL ENTRY SOLDIERS
- 439 I WAS TIV INSTRUCTOR FROM 80-81 AFTER THAT I WAS SUPPLY SGT NOW I WORKING AS TIV PLATOON SGT

CREW 4: DUTY DESCRIPTION (continued)

439 SECTION SGT. FOR A LOW WEAPON'S SYSTEM MOUNTED ON AN M151A2
 440 ACTED BRIEFLY AS PLT SGT FOR AN AT PLT, SECTION LDR FOR ANOTHER SHORT PERIOD OF TIME AND APPROX 9 MONTHS AS TNG NCO AND
 441 OCCASIONALLY QUALIFYING ON THE TTV (WORKED WITH THE TTV FOR APPROX 2 1/2 YEARS) WORKED WITH M220 TOW FOR 2 YEARS
 442 I WAS A SECT. LDR. IN KOREA FOR 1 YR. AND NOW I HAVE BEEN A SECT. LDR IN GERMANY FOR 6 MONTHS.
 443 SENIOR INSTRUCTOR TOW GROUND MOUNT
 444 SENIOR INSTRUCTOR ON TOW GUNNERY TRAINING COURSE, IMPROVED TOW VEHICLE AND DRAGON.
 445 INSTRUCTOR OF TTV CREW'S TRAINING FOUR CREWMEN FOR (1-9) TTV
 446 I HAVE INSTRUCTED TTV CREWMEN FOR THE PAST YEAR. ALL STUDENT WERE INITIAL ENTRY STUDENT DURING BASIC AND ADVANCED TRAINING.
 447 I HAVE BEEN ASSIGNED AS SR. INSTRUCTOR ON THE TTV FOR THE PAST 7 MONTHS. I HAVE HAD PREVIOUS EXPERIENCE ON ALL POSITIONS ON THE
 TTV AND TOW SYSTEMS.

Appendix C
SINGLE SYMPTOM EFFECT ON PERFORMANCE

Each figure of this appendix is devoted to one position within a crew. Figure C.2, for example, shows one strip of plots for each of the two tasks performed by crew 1 (gun crew) position 2 (gunner). Performance is plotted on the vertical axis ranging from 0 to 1.0. The horizontal axis is composed of symptom complexes that differ from one another in only one symptom (usually). The first plot shows symptom complex 11X 111 where X (fatigability and weakness) ranges from severity level 1 to severity level 4.

The heavy line connects the median values of the soldiers' performance estimates for each of the symptom complexes. The upper and lower lines connect the extreme estimates. The other two lines connect the upper and lower quartile points. In the first plot on this page, the upper extreme, the upper quartile, and the median all lie on 1.0 for all the symptom complexes.

If we have described the increasingly severe aspects of symptom complexes clearly, and the soldier estimates of performance are consistent with that description, the lines connecting the points on the plots should trend downward or should remain level. If one of the lines were to reverse (slope upward), it would indicate that performance improves as sickness becomes more severe.

There are several instances of reversals; not all are cause for concern. A reversal in one of the extremes can result from the estimates of a single respondent. A shallow reversal may be due to the scatter of the estimates about two values that are essentially the same. But if the reversal is steep, involves the median, and is repeated for several crews, it indicates a difficulty in symptom interpretation. There does seem to be a difficulty with the symptom complex pairs 112 111/113 111, 411 111/412 111, 214, 112/314 112/414 112, 314 113/315 113, and 525 111/535 111.

However, there is a more important aspect shown by the single-symptom plots; that is, there is a pronounced difference between tasks for some positions. For example in Fig. C.4, crew 1 (gun crew) position 4 (loader) tasks 6 and 7 have very different patterns, as do tasks 9 and 10--implying that those tasks will suffer different degradation patterns than other tasks performed by the same crewmember, and therefore should be analyzed separately.

Task 1 : Receive fire order and call quadrant elevation, deflection, projectile, charge, fuze.

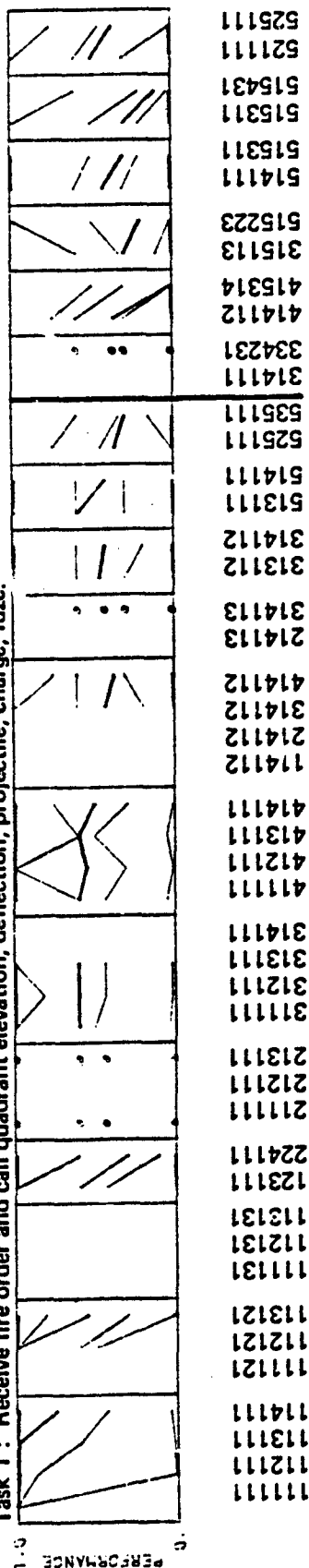


Figure C.1. Single symptom plots: gun crew, chief of section (crew 1, position 1).

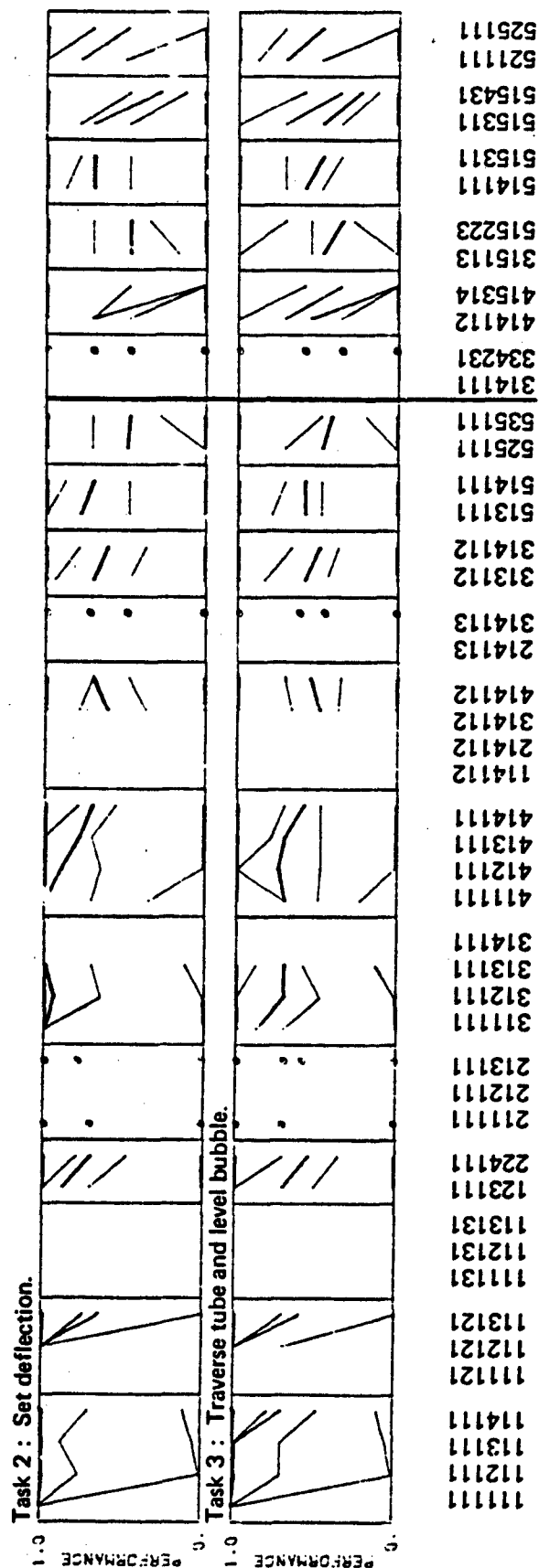


Figure C.2. Single symptom plots: gun crew, gunner (crew 1, position 2).



Figure C.4. Single symptom plots: gun crew, loader (crew 1, position 4).

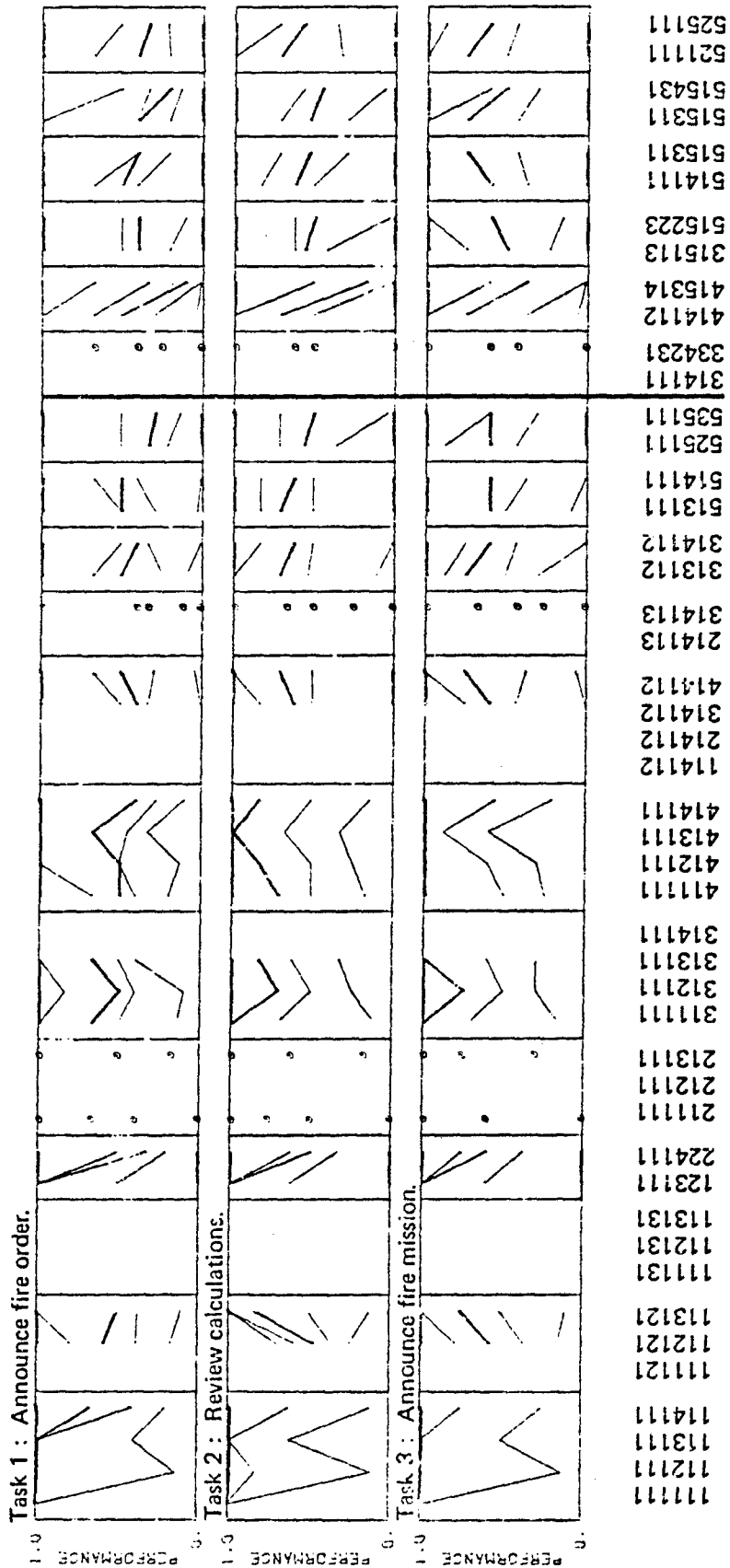


Figure C.5. Single symptom plots: FDC crew, fire direction officer (crew 2, position 1).

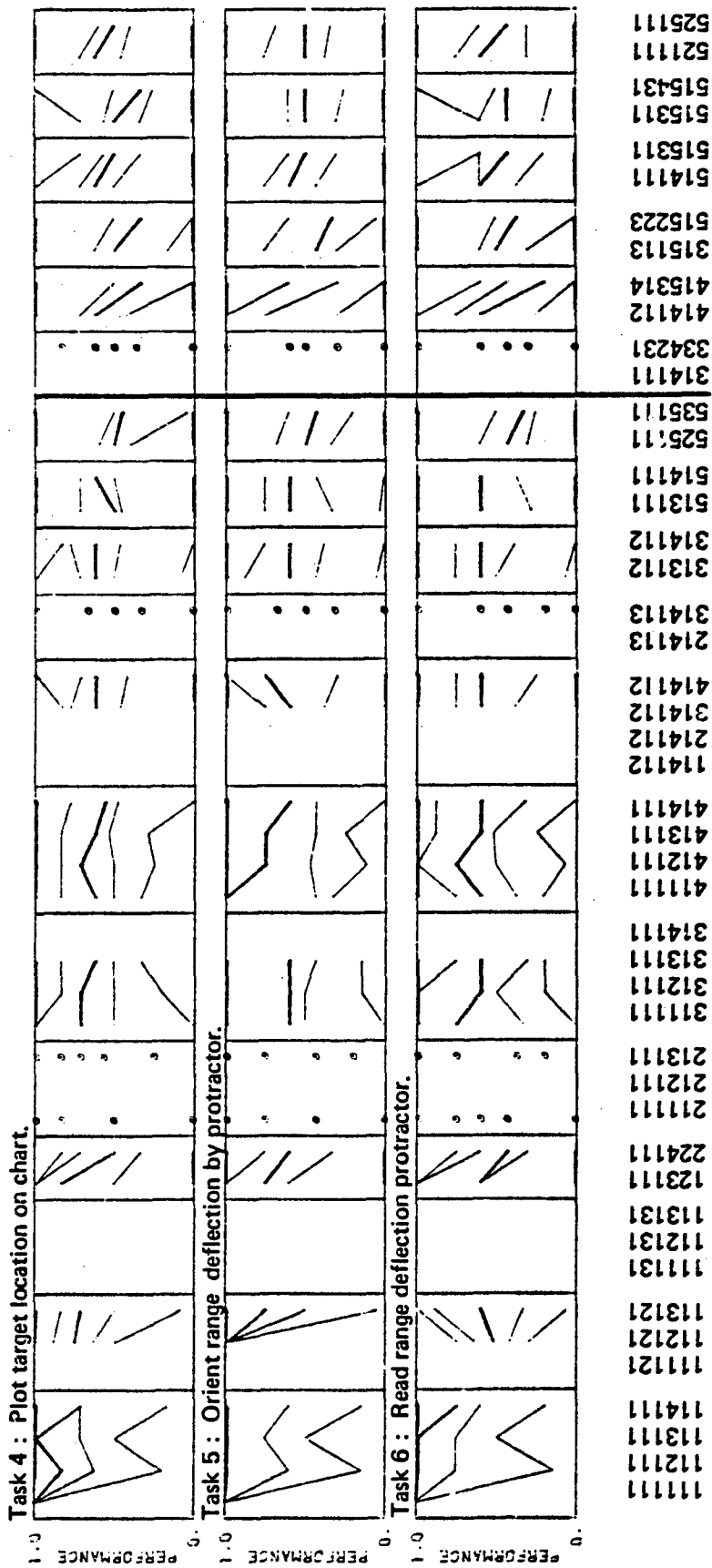


Figure C.6. Single symptom plots: FDC crew, horizontal control operator (crew 2, position 2).

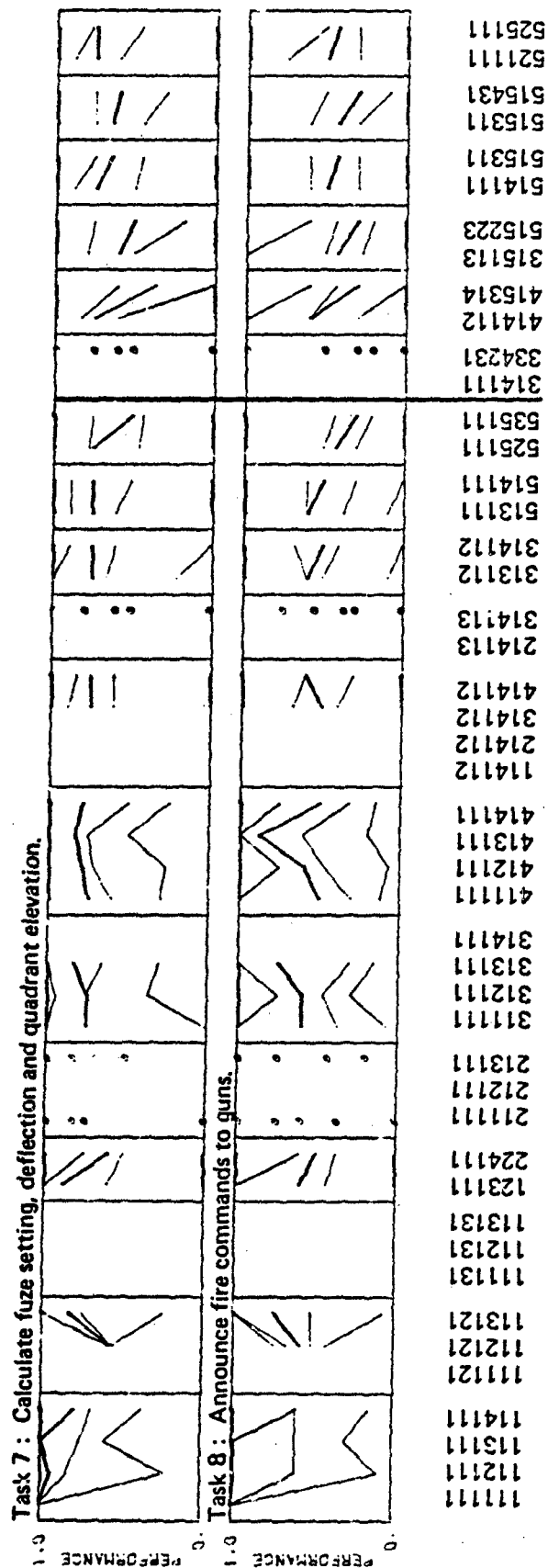


Figure C.7. Single symptom plots: FDC crew, computer (crew 2, position 3).

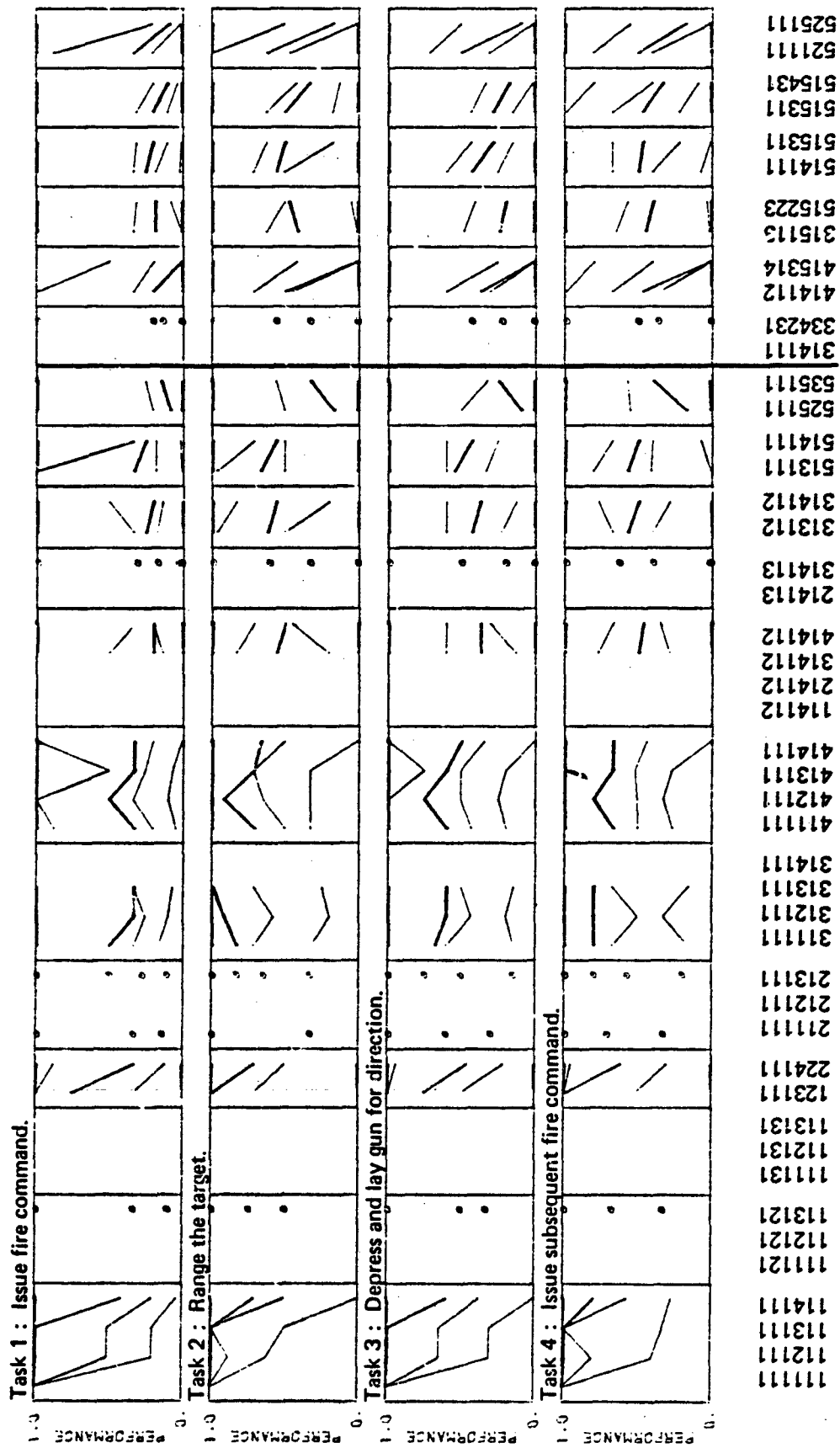
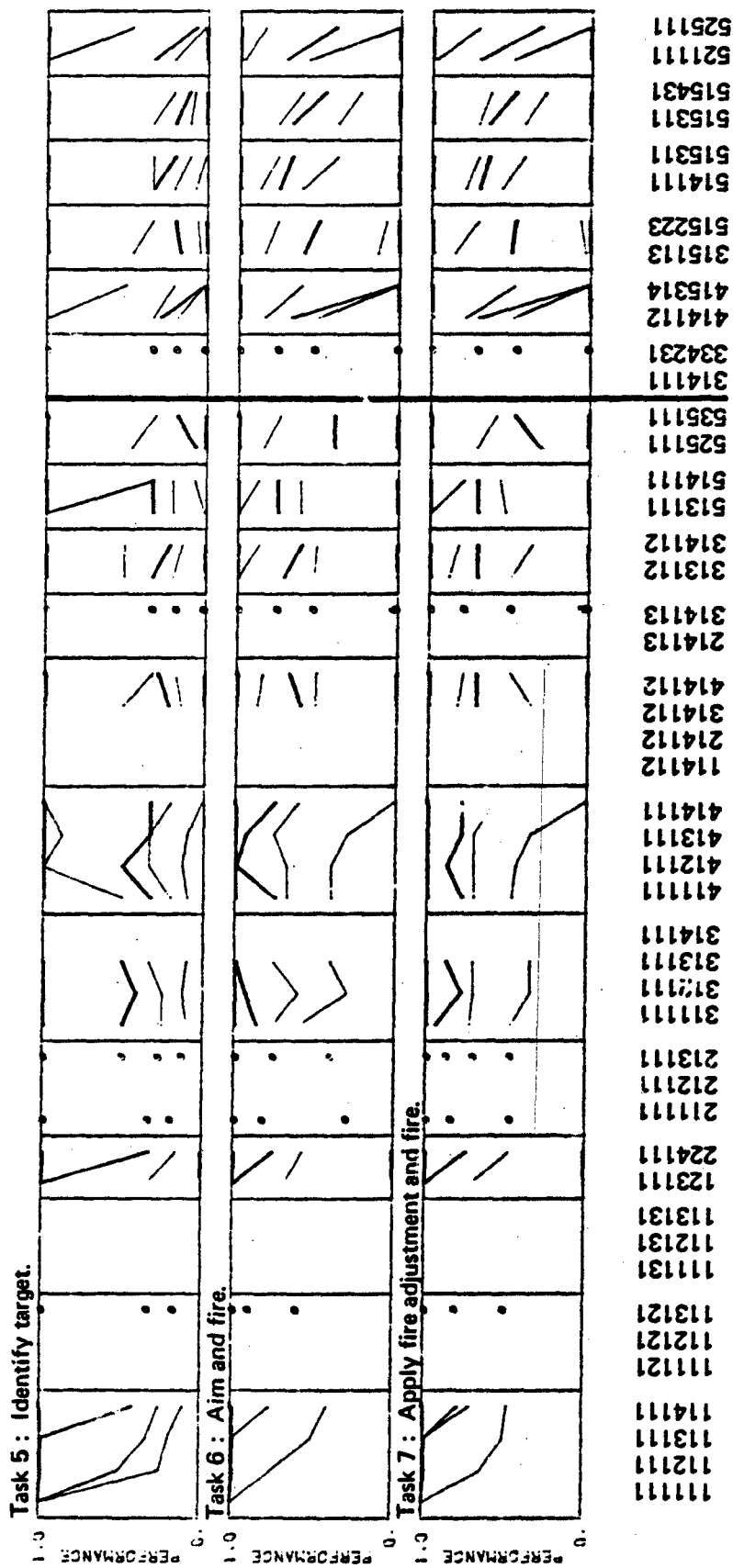


Figure C.8. Single symptom plots: tank crew, tank commander (crew 3, position 1).



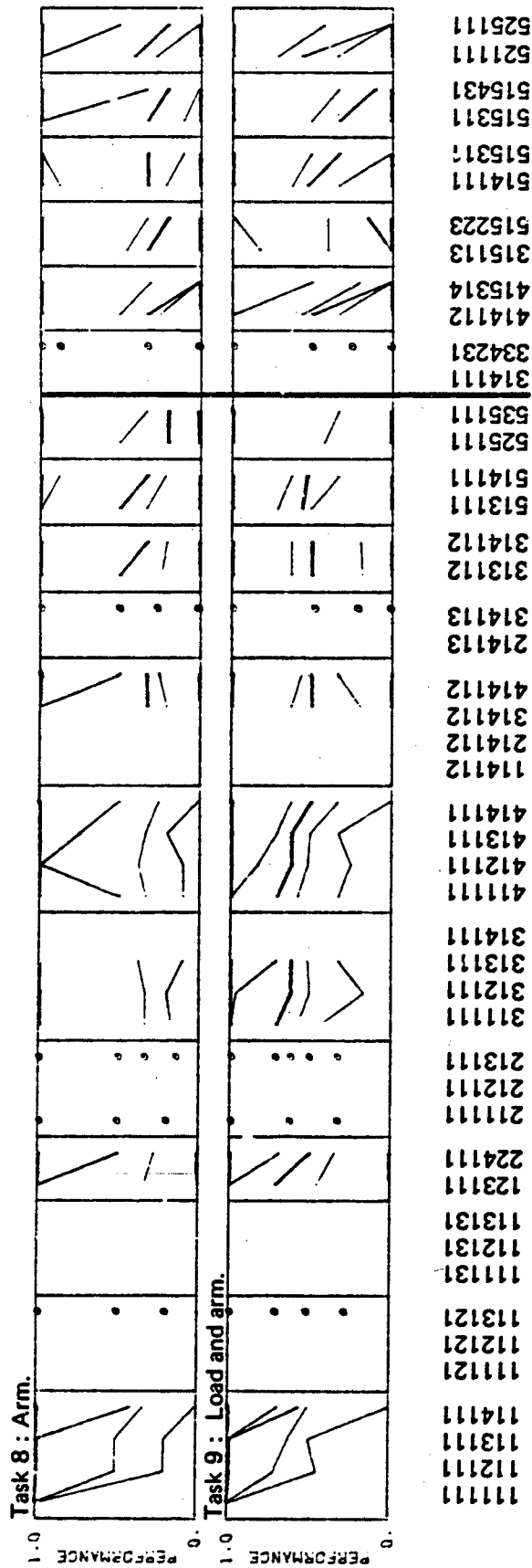


Figure C.10. Single symptom plots: tank crew, loader (crew 3, position 3).

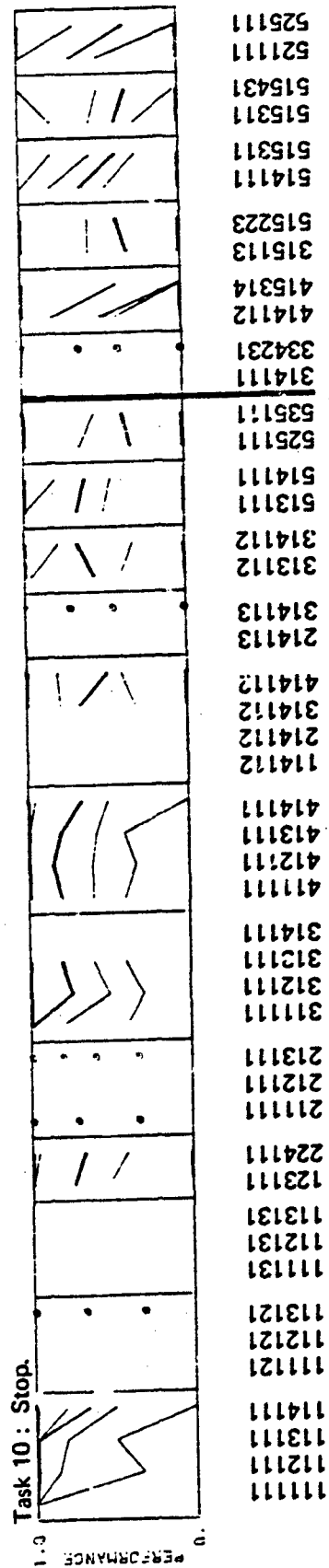


Figure C.11. Single symptom plots: tank crew, driver (crew 3, position 4).

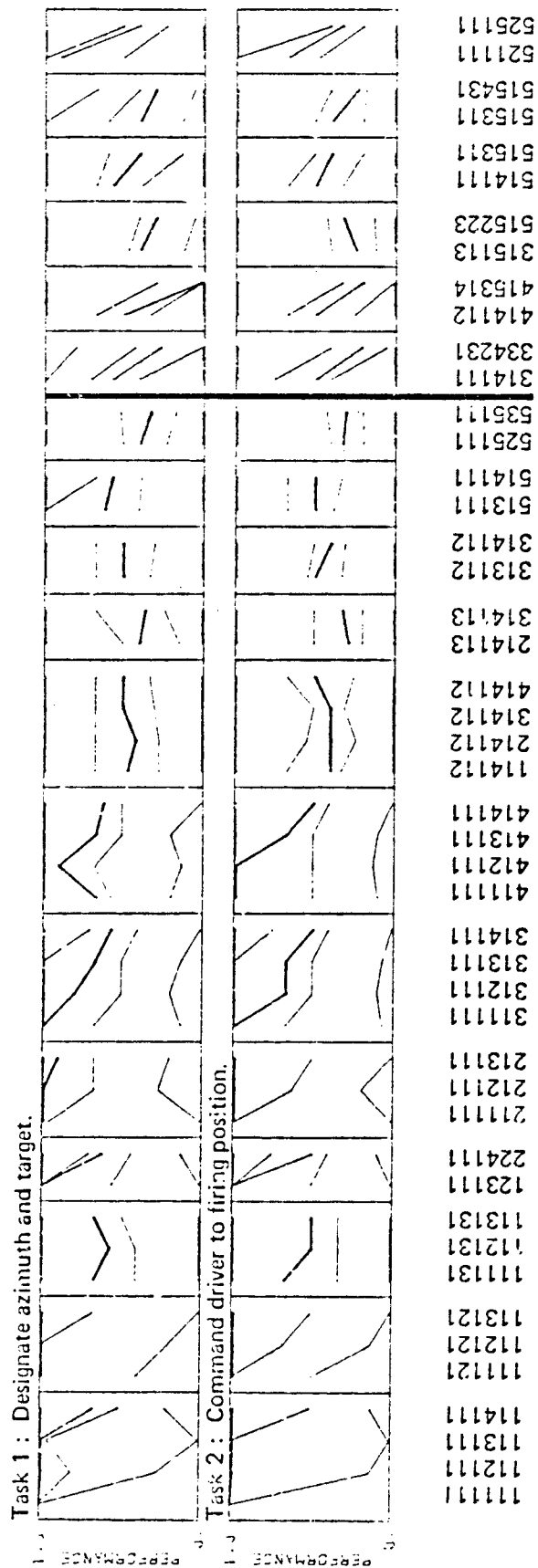


Figure C.12. Single symptom plots: TOW crew, squad leader (crew 4, position 1).

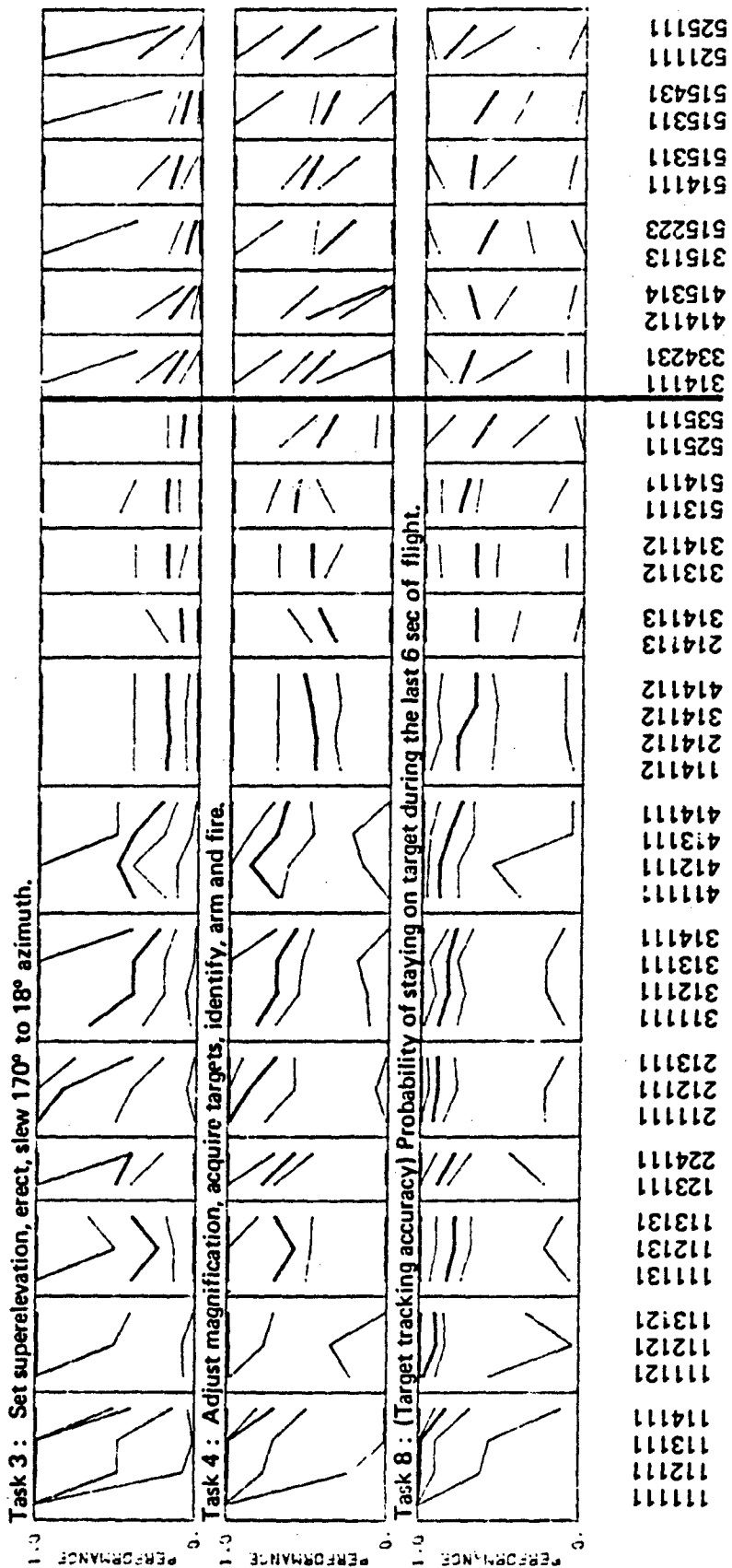


Figure C.13. Single symptom plots: TOW crew, gunner (crew 4, position 2).

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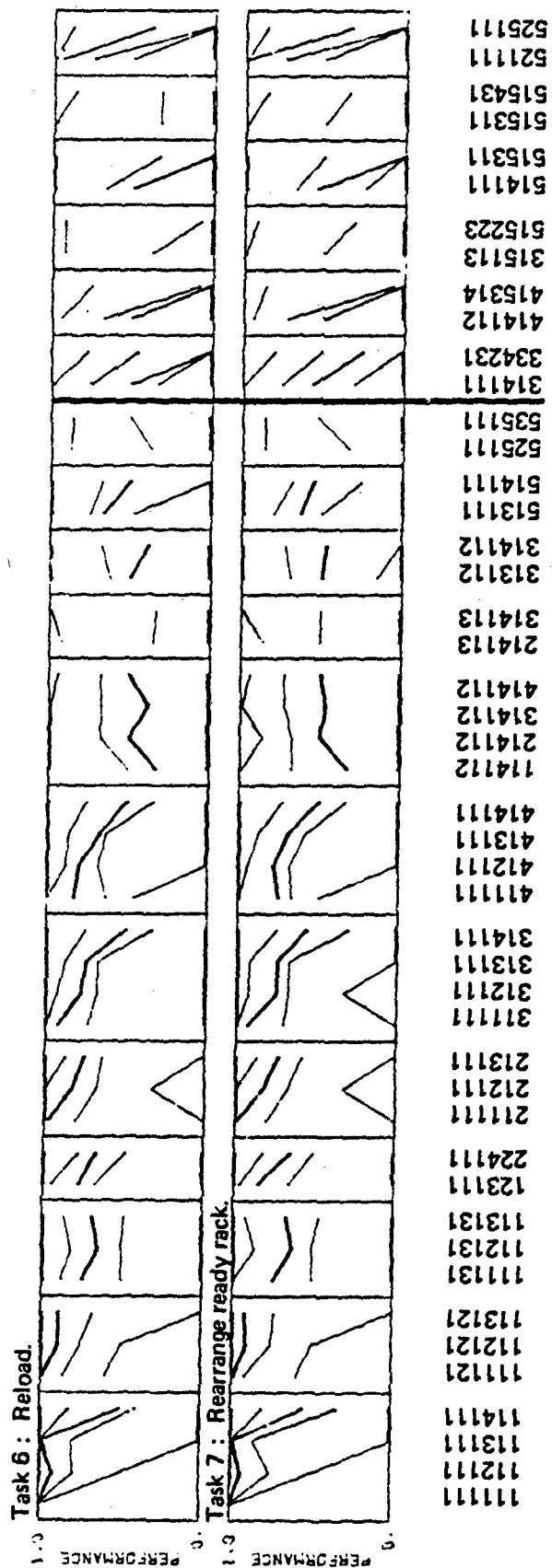


Figure C.15. Single symptom plots: TOW crew, loader (crew 4), position 4).

Appendix D

RETURNS FROM REJECTED RESPONDENTS' QUESTIONNAIRES

The format for the sheets in this appendix is the same as the format used in Appendix A.

Each sheet of this appendix contains the returns from the questionnaire of one of the 21 respondents who were rejected because their answers were not responsive. The nature of those unresponsive answers was described in Sec. 2, and is summarized in the table below.

Table D.1. Unresponsive answers.

Respondent Number	Percent Noncompliant	Percent Extremes	Percent Excessive Consistency	Percent Combined	Percent Reversals ^a
106		45			40 ^b
108		19	54	73 ^b	
113	5	81 ^b		86 ^b	
115		47	47	94 ^b	
121	10 ^b	55	16	81 ^b	
124	97 ^b				
138		26			40 ^b
218		30	48	78 ^b	
232					43 ^b
237					47 ^b
238					43 ^b
301		99 ^b			
303			95 ^b		
304		91 ^b			
307		53	31	84 ^b	
309		43	39	82 ^b	
312					38 ^b
316		29	62	91 ^b	
338		22	67	89 ^b	
403		38	20	58 ^c	28 ^c
438					49 ^b

^aFifty percent = random.

^bGrounds for rejection.

^cRejected for combined causes plus reversals.

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0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA
 GRADE : F-5
 MU : 3020
 IN ARMY : 10YR
 IN ARTILLERY : 10YR
 WHEN :
 COMBAT :
 ARTILL. CONCENTR :
 WHEN :
 #SUPERVISED : 5

CREW TASKS

CREW										SYMP COMP										CLIMB STAIRS										LIFT BOXES										CLIMB STAIRS										WALK BOXES										LIFT BOXES										UPEN LOCK										CH. SECT										GUNNER										AST. GUNNER										LOADER										FIRE										SMASH										INSPECT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				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I HAVE BEEN A ASPIRER IN SPECIAL WEAPON FOR LAST YEAR

DEMOGRAPHIC DATA WHEN HOW LONG
 MOY IF-5 CH. OF SECTION: HO YR YR NO
 IN ARMY : 3 YR 1000 : A R2 4
 IN ARTILLERY : 3 YR 10 LOADED
 COMBAT : IN
 ARTIL. CORPATION : SUPERVISED : 5

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

CREW TASKS

ORDINARY TASKS

CREW	SYMP PUMP	CON	CLIMB STAIRS	LIFT BOXES	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	CH. SECT	RUNNER		AST. GUNNER		LOADER					FIRE	SWAB	INSPECT		
										SET DLF	TRAV LEVEL	SET ELEV	UNAD ELEV	POS	PLACE OP CHARGE	INS PRIM							
										7	7	7	3	2	5	2	1.5	1.5	3				
										UNSTIPULATED													
1	8	411111	4	30	5	15	30	30	7	10	0	7	7	0	6	5	2	4	10				
1	8	515431	4	30	7	15	20	20	20	15	0	0	0	7	10	10	3	3	10				
1	8	114111	4	45	2	5	10	20	0	0	0	0	0	10	7	5	3	3	5				
1	8	515311	4	40	3	10	10	10	7	12	14	10	5	10	10	0	2	0	5				
1	8	215111	4	40	5	10	7	10	15	15	15	15	15	20	30	10	5	10	4				
1	8	413111	4	20	4	10	7	10	5	10	10	14	7	9	8	5	3	3	6				
1	8	311111	4	30	40	15	7	4	30	10	20	10	10	10	15	6	3	2	999				
1	8	315111	4	30	5	10	5	10	10	4	14	14	5	4	7	4	2	3	6				
1	8	515223	4	20	5	10	6	4	10	0	0	0	5	5	10	6	3	3	6				
1	8	414112	4	30	5	10	7	5	7	10	10	10	5	4	9	5	3	3	6				
1	8	532111	4	30	7	10	8	10	5	14	14	14	6	5	10	4	3	3	6				
1	8	112111	4	20	25	7	15	10	6	9	0	9	0	3	0	0	0	3	0				
1	8	521111	4	20	45	7	7	10	6	14	14	14	6	4	10	4	3	3	6				
1	8	113111	4	30	40	6	7	4	0	0	0	0	6	4	10	4	3	3	0				
1	8	34231	4	30	4	2	4	10	10	15	14	14	6	4	10	4	3	3	6				
1	8	123111	4	20	10	15	8	4	0	0	0	0	0	0	0	0	0	0	6				
1	8	513111	4	20	7	10	0	4	6	10	10	14	6	4	10	4	3	3	6				
1	8	315113	4	-1	2	3	2	4	7	14	14	14	7	-1	10	4	3	3	6				
1	8	214131	4	30	40	7	8	4	6	14	14	14	7	4	10	4	3	4	6				
1	8	514111	4	-1	2	2	3	4	7	13	13	13	5	10	10	4	3	4	6				
1	8	112121	4	20	40	5	7	4	0	0	0	0	4	4	7	5	0	0	6				
1	8	211111	4	20	20	7	6	7	4	4	4	4	4	6	10	0	0	0	6				
1	8	224111	4	30	5	6	7	4	4	14	14	14	6	5	10	0	0	0	6				
1	8	415314	4	30	6	4	8	4	6	14	14	14	6	4	10	5	4	4	6				

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 :F-5 :CH. OF SECTION: YR YR MO
 :1320 :GUNNER : 79 3
 :BYR :AS.GUNNER : 78 1
 :BYR :LOADER : 76 2
 :BYR :LOADER : 74 1 6

COMBAT :N
 ARTIL. COMBAT :N
 #SUPERVISED : 5

CREW										CREW TASKS									
RESP										CREW TASKS									
USUAL TIME, SEC										CREW TASKS									
UNUSUAL TIME, SEC										CREW TASKS									
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UNUSUAL TIME, SEC										CREW TASKS									

DEMOGRAPHIC DATA
 GRADE : F-6
 MOS : 313030
 IN ARMY : 4YR
 IN ARTILLERY : 4YR
 WHEN :
 HOW LONG :
 NO YR : 2
 YR MO : 10
 CH. OF SECTION : 1
 GUNNER :
 AS. GUNNER :
 LOADER :
 WHEN :
 #SUPERVISED : 10

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 0=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

CREW TASKS

ORDINARY TASKS

CREW MFSR	USUAL TIME, SEC	CH. SECT				GUNNER		AST. GUNNER		LOADER			
		CLIMB	WALK	LIFT	OPEN	SET	TRAV	SET	ELEV	POS	PLACE	INS	SWAB
		STAIRS	STAIRS	BOXES	LOCK	DEF	LEVEL	QUAD	LEVEL	OP	CHARGE	PRIM	INSPECT
		15	20	UNSTIPULATED		7	7	7	5	2	5	1.5	1.5
1 15 41111	0	999	999	999	999	0	0	0	0	0	0	0	0
1 15 515431	0	-1	40	999	20	10	10	0	8	0	0	0	0
1 15 114111	0	25	30	999	999	0	9	0	0	4	0	0	0
1 15 515111	5	-1	30	999	999	0	9	0	7	6	3	0	0
1 15 213111	5	20	30	999	999	0	0	0	6	0	0	0	0
1 15 413111	5	20	25	999	999	0	0	0	0	0	0	0	0
1 15 311111	5	5	10	999	999	0	0	0	0	0	0	0	0
1 15 313111	5	5	10	999	999	0	0	0	0	0	0	0	0
1 15 515221	0	-1	-1	999	999	0	2	0	2	0	0	0	0
1 15 414112	0	-1	-1	999	999	-1	-1	-1	-1	-1	-1	-1	-1
1 15 535111	5	-1	-1	999	999	7	3	3	3	4	1.5	1.5	1.5
1 15 112111	5	2	2	999	999	0	2	0	2	0	0	0	0
1 15 514111	0	-1	-1	999	999	7	7	7	7	2	1.5	1.5	1.5
1 15 313112	5	5	5	999	999	3	7	7	3	4	1.5	1.5	1.5
1 15 515111	0	-1	-1	999	999	-1	-1	-1	-1	-1	-1	-1	-1
1 15 123111	5	2	5	999	999	4	6	5	3	4	1.5	1.5	1.5
1 15 334231	5	-1	-1	999	999	0	0	0	0	0	0	0	0
1 15 113111	5	2	2	999	999	-1	-1	-1	-1	-1	-1	-1	-1
1 15 521111	5	2	5	999	999	0	0	0	0	1	0	0	0
1 15 113121	0	-1	-1	999	999	0	0	0	0	1	0	0	0
1 15 211111	5	2	5	999	999	3	3	3	3	2	1.5	1.5	1.5
1 15 413111	0	-1	-1	999	999	7	7	7	3	2	1.5	1.5	1.5
1 15 312111	5	-1	-1	999	999	-1	-1	-1	-1	-1	-1	-1	-1
1 15 314112	5	2	5	999	999	0	0	0	0	2	1.5	1.5	1.5
1 15 314113	5	-1	-1	999	999	3	3	0	3	2	1.5	1.5	1.5
1 15 314114	5	-1	-1	999	999	-1	-1	-1	-1	-1	-1	-1	-1
1 15 412111	0	2	5	999	999	0	0	0	0	2	1.5	1.5	1.5
1 15 414111	0	2	5	999	999	0	0	0	0	2	1.5	1.5	1.5
1 15 525111	0	-1	-1	999	999	0	7	7	3	-1	1.5	1.5	1.5

DURING THE PAST YEAR I HAVE HELD AMMO SECTION CHIEF AND HOWITZER SECTION CHIEF

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

155 S.P. GUN CREW

DEMOGRAPHIC DATA
 WHEN HOW LONG
 HD YN YN HD
 CH.OF SECTIONS: 1 1 5
 GUNNER : 1 1
 AS.GUNNER :
 LOADER :
 WHEN
 COMBAT IN
 ARTIL. COMBAT: 10
 SUPERVISED : 10

CREW TASKS									
UPDTARY TASKS									
CH. SECT									
GUNNER									
AST. GUNNER									
LOADER									
LIFT POS PRCL									
OP CHARGE									
INS FIRE									
SMAR									
INSPECT									
RAMMER									
UNSTIPULATED									
USUAL TIME SEC									
15 20									
1 21 411111	3	5	10	10	4	35	3	2	3
1 21 515431	2	-1	-1	25	1	20	35	2	20
1 21 114111	2	30	25	1	1	25	20	10	10
1 21 515311	2	-1	-1	1	1	10	1	1	25
1 21 213111	2	0	15	3	3	40	3	3	20
1 21 413111	2	0	5	3	3	3	2	2	25
1 21 311111	2	5	15	2	2	45	2	2	15
1 21 313111	2	-1	-1	2	2	30	3	3	20
1 21 515223	1	-1	-1	1	1	10	2	2	25
1 21 414112	3	-1	-1	2	2	20	3	3	15
1 21 515111	3	-1	20	3	3	25	3	3	15
1 21 112111	3	5	5	4	4	60	4	4	7
1 21 313112	2	-1	-1	1	1	10	2	2	20
1 21 315112	2	-1	-1	1	1	10	2	2	20
1 21 515111	2	15	15	2	2	45	3	3	15
1 21 123111	2	5	5	2	2	70	3	3	15
1 21 314231	0	-1	-1	2	2	55	2	2	10
1 21 113111	2	0	10	3	3	120	4	4	5
1 21 521111	2	10	5	2	2	35	3	3	10
1 21 113121	2	10	5	2	2	45	3	3	15
1 21 211111	2	10	5	2	2	35	3	3	15
1 21 224111	2	-1	-1	1	1	50	2	2	12
1 21 415111	1	-1	-1	1	1	5	2	2	10
1 21 312111	2	20	15	3	3	60	2	2	40
1 21 314112	2	-1	-1	1	1	15	1	1	20
1 21 314113	2	-1	-1	1	1	10	1	1	30
1 21 412111	2	10	5	2	2	70	3	3	15
1 21 414111	2	-1	-1	1	1	60	2	2	15
1 21 525111	2	-1	-1	2	2	40	3	3	20

I HAVEN'T REALLY HAD ANY. MUST OF THE TIMES THIS PAST YEAR I HAVE BEEN MOVED AROUND A LOT.

DEMOGRAPHIC DATA

GRADE : F-5
MOS : 13050
IN ARMY : 3YR
IN ARTILLERY : 3YR

WHEN
MO YR MO
NO 9 92
A 1 1 3

CH.OF SECTION: 9 A2
GUNNER : 4 A1
AS.GUNNER :
LOADER :

COMBAT :
ARTILL. COMBAT : 10*

#SUPERVISED : 10*

155 S.P. GUN CREW

0=NO INCREASE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

CREW TASKS

ORDINARY TASKS

CREW HSP	STMP CAMP	COM CLIMB	LIFT BOXES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	CM. SEC1 CALL QUAD ELEV	GUNNER		AST. GUNNER		LOADER		FIRE	INS PHIM	SHAB INSPECT
									SET DEF	TRAV LEVEL	SET UNAD LLEV	FLEV LEVEL	POS OP	CHARGE			
USUAL TIME: SEC	15	20	UNSTIPULATED				3	7	7	1	3	2	5	2	1.5	1.5	3

1 30 411111 4	40	50	4	40	30	30	15	10	10	7	10	5	8	5	4	0	4
1 30 515031 4	35	45	2	15	6	30	25	15	15	15	15	15	13	10	7	2.5	8
1 30 114111 8	30	40	2	3	10	20	13	16	16	8	16	20	15	8	4.5	3.5	9
1 30 515111 4	45	60	1	2	5	20	25	25	25	25	25	-1	25	25	2	20	18
1 30 213111 2	25	35	6	25	29	10	10	9	9	5	9	4	7	4	3.5	3.5	5
1 30 413111 2	30	40	3	10	13	45	7	11	11	11	11	13	10	10	7	10	10
1 30 311111 2	20	31	7	30	30	15	5	0	0	0	0	4	7	4	2.5	2	5
1 30 313111 2	25	30	7	15	13	18	7	0	0	0	0	5	6	5	3	0	4
1 30 515223 3	50	60	1	2	5	30	30	15	15	15	15	-1	20	20	15	7	15
1 30 414112 3	25	30	7	15	15	15	15	20	20	15	15	-1	11	0	3	0	8
1 30 515111 4	45	50	2	10	10	30	25	18	18	18	18	18	18	18	10	5	15
1 30 112111 4	20	25	8	30	20	9	0	0	0	0	0	4	0	0	0	0	0
1 30 514111 3	30	30	6	15	25	18	5	0	0	0	0	4	7	5	3	3	7
1 30 313112 3	20	30	5	10	9	19	10	15	15	15	15	7	7	4	3.5	2	7
1 30 315112 2	30	40	2	7	10	19	-1	-1	-1	-1	-1	-1	-1	-1	2.5	2	8
1 30 513111 2	30	40	6	15	10	15	10	15	15	10	10	8	15	8	3	0	8
1 30 123111 3	30	40	6	15	10	20	10	20	20	10	10	8	10	8	5	3	9
1 30 314231 2	-1	-1	1	5	6	25	-1	-1	-1	-1	-1	-1	-1	-1	5	5	-1
1 30 113111 3	20	35	8	30	15	15	0	0	0	0	0	5	6	4	2	0	4
1 30 511111 3	30	40	6	15	15	20	5	10	10	10	10	8	11	5	4.5	2.5	8
1 30 113121 3	30	45	6	10	10	20	12	13	13	13	13	8	10	5	2.5	2.5	8
1 30 211111 3	33	45	6	15	10	20	10	0	0	0	0	0	0	0	0	0	0
1 30 214111 3	33	45	6	10	13	20	10	15	15	10	10	4	10	4	2.5	2	8
1 30 415114 2	-1	-1	1	2	3	30	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 30 312111 3	30	43	6	10	15	20	10	15	15	10	10	9	12	5	3	2	8
1 30 314112 2	35	45	6	15	10	21	29	20	20	15	15	-1	10	12	3	2	8
1 30 314113 2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
1 30 412111 2	35	40	4	15	12	21	10	15	15	10	10	8	7	8	3	2	8
1 30 414111 2	30	44	4	10	9	25	20	24	24	20	20	-1	20	48	5	4	8
1 30 515111 2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

CURRENTLY WORKING AS AN FUC CHIEF IN A TACFIRE UNIT. I WAS MANUAL FUC 14 TFS PREVIOUS TO THIS. HAVE WORK EVERY LEVEL FROM RTTY TO DETACH USUALLY AS CHIEF OF ENL.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIREF DIRECTION CENTER CREW

DEMOGRAPHIC DATA
 GRADE : F-7
 MOS : 515040
 IN ARMY : 16YR
 IN ARTILLERY : 16YR
 WHEN : 64 10
 HOW LONG : 2
 FDC HCU : 64
 FDC COMPUTER : 66
 COMBAT : Y 71
 ARTIL. COMBAT : N
 #SHOTS FIRED : 50

CREW TASKS

ORDINARY TASKS

CREW RESP COMP	SYMP COMP	CON LIMB	STAIRS	LIFT CLIMB POWERS	WALK STAIRS	LIFT BOXES	UPEN LOCK	FNU				HCU				COMPUTER				
								SAY MISN	REVIEW CALC	SAY ORDER	PLUT TGT	ORIENT RDP	READ RANGE	CALC U O	SAY SET					
USUAL TIME, SEC																15	3	3	15	3
2 18 411111	3	20	-1	20	20	10	5	20	10	20	2	5	3	1	1	3	15	3		
2 18 515031	3	-1	60	60	60	10	1	1	1	40	6	5	5	0	0	0	0	0		
2 18 114111	3	35	60	60	60	10	1	1	1	30	0	0	0	0	0	0	25	6		
2 18 515111	3	60	60	60	60	10	1	1	1	30	5	10	6	10	6	6	30	5		
2 18 213111	3	60	80	80	80	10	2	5	2	25	5	0	6	8	5	5	20	10		
2 18 413111	3	60	80	80	80	10	2	3	3	30	0	0	0	7	5	5	0	5		
2 18 311111	3	30	40	40	40	10	4	10	5	30	5	6	5	7	5	5	20	6		
2 18 313111	3	30	60	60	60	10	2	3	3	30	6	15	9	15	9	6	30	9		
2 18 515221	3	-1	-1	-1	-1	1	1	1	1	30	6	8	6	10	6	6	20	6		
2 18 414112	3	120	120	120	120	1	1	1	1	30	6	8	6	10	6	6	20	6		
2 18 515111	3	-1	-1	-1	-1	1	1	1	1	30	0	0	0	0	0	0	0	0		
2 18 112111	3	30	40	40	40	5	10	10	5	20	0	0	0	0	0	0	20	6		
2 18 514111	3	60	80	80	80	10	2	3	3	30	4	8	6	8	6	6	20	6		
2 18 313112	3	60	80	80	80	10	1	3	3	30	5	8	6	10	6	6	20	6		
2 18 515113	3	-1	-1	-1	-1	1	1	1	1	30	5	7	5	7	5	5	17	15		
2 18 113111	3	60	80	80	80	10	3	3	3	25	4	7	5	7	5	5	17	15		
2 18 123111	3	60	80	80	80	10	2	3	3	30	5	8	6	8	6	6	20	6		
2 18 514231	3	-1	-1	-1	-1	1	1	1	1	30	0	0	0	0	0	0	0	0		
2 18 113111	3	20	30	30	30	5	10	10	5	30	0	0	0	0	0	0	0	0		
2 18 521111	3	60	80	80	80	10	3	5	3	25	4	7	5	7	5	5	17	15		
2 18 113121	3	60	80	80	80	10	3	5	3	25	4	7	5	7	5	5	17	15		
2 18 211111	3	30	40	40	40	1	1	1	1	30	3	0	4	0	0	4	0	5		
2 18 224111	3	60	80	80	80	1	1	1	1	40	6	15	9	15	9	9	30	10		
2 18 415114	3	-1	-1	-1	-1	1	1	1	1	30	5	0	4	0	0	4	0	5		
2 18 512111	3	60	80	80	80	1	1	1	1	30	3	0	4	0	0	4	0	5		
2 18 314112	3	60	80	80	80	1	1	1	1	30	3	0	4	0	0	4	0	5		
2 18 514113	3	-1	-1	-1	-1	1	1	1	1	30	3	0	4	0	0	4	0	5		
2 18 412111	3	60	80	80	80	1	1	1	1	30	3	0	4	0	0	4	0	5		
2 18 414111	3	60	80	80	80	1	1	1	1	30	0	0	4	0	0	4	0	5		
2 18 525111	3	-1	-1	-1	-1	1	1	1	1	40	4	10	6	10	6	6	30	6		

I WAS SECTION CHIEF. I POLISHED ON LOOKED OVER AND TAUGHT MY MEN THE CORRECT WAYS TO COMPUTE DATA AND I FIGURED DATA FOR ALL TYPE OF BATTERIES WITH A 100AP FIGHTING BATTERY.

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE : F-4 FDC HCO : 10 YR YR HD
 MOS : 13F10 FDC COMPUTER : A1
 IN ARMY : 2YR AND
 IN ARTILLERY : 2YR A
 COMBAT : IN
 ACQUIL. COMBAT : #SUPERVISED : 5

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

FIRE DIRECTION CENTER CREW

ORDINARY TASKS										CREW TASKS																
CREW	RESP	SYMP	CON	CLIMB	STAIRS	LIFT	CLIMB	WALK	LIFT	OPEN	FDC					HCO					COMPUTER					
											SELF-STIPULATED VALUES	BOXES	LOCK	SAY	REVIEW	SAY	PLUT	ORIENT	HEAD	PLUT	ORIENT	HEAD	CALC	SAY	CALC	SAY
												10	10	10	20	5	2	5	3	1	1	3	15	3		
												CONFIDENCE 4														
2	32	525111	0	35	7	3	3	3	4	6	15	25	15	11	9	13	20	16								
2	32	414111	0	60	2	3	3	3	3	7	7	10	7	10	5	15	26	30								
2	32	412111	0	0	4	0	6	1.5	5	5	6	10	10	7	5	6	17	9								
2	32	314113	0	55	2	3	3	3	3	3	20	30	20	12	7	8	48	50								
2	32	314112	0	75	1	1	2	3	3	3	28	45	33	30	20	18	55	65								
2	32	312111	0	10	4	4	3	3	3	5	8	10	9	8	4	6	0	10								
2	32	415314	3	120	2	1	2	3	3	3	100	120	85	60	15	30	48	85								
2	32	224111	0	75	3	3	2	3	5	5	5	18	10	9	6	10	25	45								
2	32	211111	0	25	5	0	5	3	3	5	5	10	12	3	4	6	17	25								
2	32	113121	0	17	5	0	6	3	3	3	4	6	6	0	0	4	0	5								
2	32	123111	0	17	3	3	2	2	2	7	15	30	25	13	6	10	25	27								
2	32	334231	0	30	4	3	3	3	5	7	5	10	8	999	999	7	999	15								
2	32	113111	0	22	4	0	5	3	3	7	8	10	8	10	4	11	25	20								
2	32	513111	0	45	3	3	3	3	3	3	4	10	9	7	4	5	27	30								
2	32	313112	0	60	2	2	2	3	3	3	9	17	8	12	4	10	17	10								
2	32	313112	0	20	4	3	3	3	3	7	10	15	12	10	4	12	0	15								
2	32	514111	0	60	2	1	2	3	2	9	10	15	12	20	6	35	45	30								
2	32	112111	0	25	6	0	4	3	4	7	5	10	8	7	0	8	0	10								
2	32	535111	0	35	3	3	3	3	3	3	10	15	20	10	0	10	0	12								
2	32	414112	0	20	4	4	3	3	3	3	10	12	10	3	0	9	0	10								
2	32	515223	0	65	1	3	2	3	2	3	10	17	12	10	5	12	0	12								
2	32	313111	0	20	4	3	3	3	3	3	7	10	7	0	0	10	0	10								
2	32	311111	0	20	5	0	4	3	4	3	6	10	8	0	0	10	0	10								
2	32	413111	3	0	3	3	3	3	3	3	6	10	7	0	0	10	0	10								
2	32	213111	3	20	3	3	3	3	3	3	6	10	6	3	4	10	0	10								
2	32	515311	0	20	4	3	3	3	4	3	8	12	8	7	4	9	0	10								
2	32	114111	0	30	4	3	3	3	3	3	10	10	4	7	0	6	0	10								
2	32	515031	0	30	2	2	2	3	2	6	10	12	10	3	0	9	0	25								
2	32	411111	0	0	6	3	3	3	4	3	0	0	0	7	0	6	0	10								

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9999=END REPLY
 9=END REPLY (FOR CONFIDENCE)

PIPE DIRECTION CENTER CREW

OFFICER/PHOTO DATA
 GRADE : 2E-4
 POS : 13510
 IN ADITY : 2YR 6
 IN ADITY : 2YR 6
 IN ADITY : 2YR 6

COMBAT : IN
 ARTIL. COORDINATE : SUPERVISED : 5

CREW TASKS

ORDINARY TASKS

CREW	SYMP	LOW	CLIMB	LIFT	CLIMB	WALK	LIFT	UPEN	SELF-STIMULATED VALUES				CONFIDENCE			
									20	20	45	5	4	2	4	5
USUAL TIME, SEC	15	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2 37 525111	3	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2 37 414111	3	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2 37 472111	3	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2 37 314113	3	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
2 37 314112	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 37 312111	3	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2 37 415114	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 37 224111	3	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2 37 211111	3	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
2 37 113121	3	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
2 37 123111	3	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
2 37 334231	3	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
2 37 113111	3	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
2 37 521111	3	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2 37 513111	3	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
2 37 315113	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 37 315112	3	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
2 37 514111	3	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
2 37 112111	3	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
2 37 525111	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 37 414112	3	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
2 37 515223	3	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
2 37 513111	3	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
2 37 511111	3	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2 37 413111	3	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2 37 213111	3	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
2 37 515111	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 37 114111	3	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
2 37 515031	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
2 37 411111	3	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35

WAVE BEEN TRAINING IN GLEET WARFARE AND TACTICS. AND HAVE BEEN SUPPORTING THE OFFICER'S ADVANCED TRAINING COURSE, WITH MY EQUIP

FIRE DIRECTION CENTER CREW

		DEFINING DATA				WHEN		HOW LONG	
						MO	YR	MO	YR
GRAUF	:	FDC	HCU	:	AO	6			
MUS	:	215F1A	FDC	COMPUTER	:	AO	2		

WISPERVISEN : 10

CHEW TASKS

FNU				MCO				COMPUTER			
SAY		CALC		PLOT		ORIENT		CALC		SAY	
MISM		UPUFM		TGT		RHP		D Q		SET	
2	5	3	1	1	3	15	3				

ADDITIONAL TASKS

	CREW	TYPIC	CON	CLIMB	LIFT	CLIMB	WALK	LIFT	OPEIN
	MESP	COMP	STAIRS	RULES	BOXES	LOCKS			
	SFLF-VALIPLATED VALVES								
DURATION TIME,SFC	15	20	4	15	12	5			
CONFIDENCE	4								

CONFIDENTIAL - A

[illegible]

3. v f s

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

PHOTOGRAPHIC DATA
 GRADE : SF-4
 MOS : 119F3Y
 IN ARMY : 0YH
 IN ARTILLERY : 8YH
 M60 TANK CREW
 COMBAT : 2H
 ARTILL. COHRT: N
 SUPERVISED : 20

CREW TASKS

UPUTINARY TASKS

CREW RFLP	USUAL TIME, SEC	SYMPTOM COMP	CON CLIMB STAIRS	LIFT BOXES	WALK	CLIMB STAIRS	OPEN LOCK	TANK COMMANDER				GUNNER				LOADER		DN STOP
								ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SURF CMD	IDENT TGT	AIM FINE	APPLY CORR	ARM	LOAD	ARM	
								1	5	3	4	1	6	7	1	5	4	
3	1 411111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 515331	2	-1	4	-1	21	90	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	1 111111	4	0	2	5	2	15	0	0	0	0	0	0	0	0	0	0	0
3	1 515331	2	-1	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 213111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 413111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 313111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 515331	2	-1	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 414112	2	0	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 533111	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 112111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 514111	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 313112	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 515111	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 513111	2	0	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 123111	2	0	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 314231	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 113111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 521111	2	-1	4	5	4	90	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	1 113121	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 214111	2	0	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 415310	2	-1	4	5	4	15	0	0	0	0	0	0	0	0	0	0	0
3	1 312111	2	0	4	5	4	60	0	0	0	0	0	0	0	0	0	0	0
3	1 314112	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 314113	2	-1	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 412111	2	0	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 414111	2	0	4	5	4	30	0	0	0	0	0	0	0	0	0	0	0
3	1 521111	2	-1	4	5	4	40	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA
 GRADE : F-6
 MOS : 19F3X8A
 IN APNY : 0YK
 IN ARTILLERY : 0YK
 WHEN :
 COMBAT : IN
 ARTILL. COMBAT : M
 WHEN :
 #SUPERVISED : 250

CREW TASKS

ORDINARY TASKS

CREW RESP	SYMP COMP	CONJ STAIRS	CLIMB STAIRS	WALK	LIFT BOXES	UPEN LOCK	ISSUE FIRE CMD	TANK COMMANDER			GUNNER			LOADER		STOP	
								RANGE	DEP LAY	ISSUE SURSO CMD	IDENT	AIM FIRE	APPLY CORN	ARM	LOAD ARM		
USUAL TIME, SEC	15	20	UNSTIPULATED					1	5	3	4	1	6	7	1	5	4
3 3 411111	3	-1	1	1	1	60	5	25	15	20	5	30	35	5	5	25	20
3 3 515031	3	-1	-1	-1	-1	180	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 114111	3	60	1	1	1	45	3	15	9	12	3	18	21	3	3	15	12
3 3 515311	3	-1	-1	-1	-1	180	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 213111	3	80	2	1	2	90	4	20	12	16	4	24	28	6	4	20	16
3 3 413111	3	120	1	1	1	60	6	30	18	24	6	36	42	6	6	30	24
3 3 311111	3	40	3	3	3	30	2	10	6	8	2	12	14	2	2	10	8
3 3 315111	3	60	1	2	1	45	3	15	9	12	3	18	21	3	3	15	12
3 3 515211	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 414112	3	80	1	1	1	600	4	20	12	16	4	24	28	4	4	20	16
3 3 535111	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 112111	3	30	3	3	3	30	2	10	6	8	2	12	14	2	2	10	8
3 3 514111	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 313112	3	75	1	1	1	75	5	25	15	20	5	30	35	5	5	25	20
3 3 515111	3	105	1	1	1	105	7	35	21	28	7	42	49	7	7	35	28
3 3 513111	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 123111	3	75	1	1	1	75	5	25	15	20	5	30	35	5	5	25	20
3 3 334231	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 113111	3	30	3	3	3	30	2	10	6	8	2	12	14	2	2	10	8
3 3 521111	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 113121	3	45	2	2	2	45	3	15	9	12	3	18	21	3	3	15	12
3 3 211111	3	30	2	2	2	40	2	10	6	8	2	12	14	2	2	10	8
3 3 224111	3	60	2	2	2	45	3	15	9	12	3	18	21	3	3	15	12
3 3 415111	3	-1	-1	-1	-1	200	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3 3 312111	3	45	1	1	1	45	3	15	9	12	3	18	21	3	3	15	12
3 3 314112	3	45	1	1	1	45	3	15	9	12	3	18	21	3	3	15	12
3 3 314111	3	80	1	1	1	60	4	20	12	16	4	24	28	4	4	20	16
3 3 412111	3	105	-1	-1	-1	105	7	35	21	28	7	42	49	7	7	35	28
3 3 414111	3	90	1	1	1	90	6	30	18	24	6	36	42	6	6	30	24
3 3 525111	3	-1	-1	-1	-1	250	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

02NO INCREASE ABOVE USUAL TIME
 -JSCANNED DO IT AT ALL
 9990NO REPLY
 92NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE : F-4 TANK COMMANDER 77 2 4
 MOS : 19F GUNNER : 76 1
 IN ARMY : 3 YR LOADER :
 IN ARTILLERY : 7YR DRIVER :
 COMBAT : IN WHEN
 ARTILL. COMPANY : SUPERVISED : 250

CREW TASKS

ORDINARY TASKS

CREW REF	SYNOPSIS COMP	CON CLIMB	STAIRS	MOVES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	ISSUE FIRE CMD	TANK COMMANDER				GUNNER				LOADER		DN STOP									
										ISSUE FIRE CMD	RANGE	DEP LAY	ISSUE SUBSD CMD	PRESENT 161	AIM FINE	APPLY CORN	ARM LOAD ARM												
USUAL TIME, SEC										15	20	UNSTIPULATED																	4
3 4 411111	3	30	1	1	1	0.5	2	20	2	0	0	0	6	0	0	0	0	0	10	7	-1								
3 4 515031	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 110111	2	35	1	1	1	1	1	30	2	0	0	6	6	4	0	10	0	12	0	0	0								
3 4 515711	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 213111	3	0	3	1	5	1	5	20	0	0	0	0	0	0	0	0	0	7	0	0	0								
3 4 413111	3	20	2	1	4	1	4	20	0	0	0	0	0	0	0	0	0	7	0	0	0								
3 4 311111	0	0	2	1	5	1	5	20	0	0	0	0	0	0	0	0	0	7	0	0	0								
3 4 313111	0	20	2	1	5	1	5	20	0	0	0	0	0	0	0	0	0	7	0	0	0								
3 4 515223	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 414112	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 515111	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 112111	0	0	2	1	5	1	5	20	0	0	0	0	0	0	0	0	0	7	0	0	0								
3 4 514111	0	20	2	1	5	1	5	20	0	0	0	0	0	5	0	0	0	7	0	0	0								
3 4 313112	3	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 315113	3	-1	-1	-1	-1	-1	-1	120	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 513111	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 123111	3	-1	-1	-1	-1	-1	-1	20	0	0	0	0	0	0	0	0	0	-1	-1	-1	-1								
3 4 340231	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 113111	0	30	1	1	2	1	2	20	0	0	0	0	0	0	0	0	0	7	0	0	0								
3 4 521111	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 113121	0	30	-1	-1	-1	-1	-1	20	2	10	6	6	6	2	12	14	2	10	0	0	0								
3 4 211111	0	0	2	1	3	1	3	20	0	0	0	0	0	0	0	0	0	0	0	0	0								
3 4 214111	0	30	-1	-1	-1	-1	-1	20	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 415114	5	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 312111	0	30	-1	-1	-1	-1	-1	20	0	0	0	0	0	0	0	0	0	0	0	0	0								
3 4 314112	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 314113	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 412111	0	30	2	1	2	1	2	20	0	0	0	0	0	0	0	0	0	0	0	0	0								
3 4 414111	0	30	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								
3 4 525111	0	-1	-1	-1	-1	-1	-1	60	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1								

1. AT THE BATTALION BATTLE COMMANDER, 1 COORDINATE ALL TANK GUNNERY AND OBSERVE TROOP MAINTENANCE.

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFERENCE)

M60 TANK CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE : F-6 TANK COMMANDER 77 3
 MOS : 19F303 GUNNER : 75 2
 IN ARMY : 74 2
 IN ARTILLERY : 74 2
 COMBAT : 74 2
 ARTILL. CORRELATION : 74 2
 #SHOTS FIRED : 10

CREW TASKS

ORDINARY TASKS

CREW REFSP	SYMP CORP	CON CLIMB STAIRS	LIFT CLIMB STAIRS	WALK	AFS	UPEN LOCK	TANK COMMANDER		GUNNER				LOADER		DR	
							ISSUE PIPE CMD	RANGE	DEP LAY	ISSUE SURSO CMD	IDENT TRG	AIM FIRE	APPLY CORR	ARM LOAD ARM		
USUAL TIME: SEC 15 20 UNJUSTIFIED																
3	7	411111	3	30	2	3	10	3	0	5	4	1	6	7	1	4
3	7	515431	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	6
3	7	114111	3	-1	-1	-1	40	3	10	10	10	4	12	12	0	-1
3	7	515311	3	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	7	215111	3	35	3	3	10	3	7	8	8	4	10	10	0	6
3	7	415111	2	30	4	3	8	3	7	7	6	3	10	10	0	6
3	7	311111	3	25	4	0	5	0	0	0	6	3	0	10	0	0
3	7	515111	0	35	3	1	3	0	6	5	7	4	0	10	0	7
3	7	515223	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	7
3	7	414112	0	45	1	1	-1	2	11	9	10	4	12	13	3	-1
3	7	515111	0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	10
3	7	112111	0	20	4	0	6	0	0	0	6	3	0	0	0	-1
3	7	514111	0	47	2	3	3	6	10	12	9	4	10	10	3	0
3	7	515112	0	30	-1	1	-1	3	6	5	7	4	8	0	8	6
3	7	515113	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0
3	7	515211	0	50	1	2	3	3	8	6	8	4	10	12	3	0
3	7	125111	0	40	1	-1	2	0	6	6	0	3	0	0	0	8
3	7	314231	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	7	115111	0	10	3	0	6	0	0	0	0	0	0	0	0	0
3	7	521111	0	50	-1	-1	-1	0	8	6	7	4	9	10	4	7
3	7	115121	0	0	4	3	3	0	0	5	6	0	0	0	0	0
3	7	211111	0	30	2	2	3	3	7	5	6	3	8	9	3	6
3	7	254111	0	07	1	-1	-1	-1	11	9	10	7	12	13	7	10
3	7	415310	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	7	312111	0	25	3	2	3	0	0	0	0	0	0	0	0	0
3	7	514112	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	7	514113	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	7	514113	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1
3	7	412111	0	40	1	1.5	4	5	9	7	8	5	10	11	5	8
3	7	414111	0	07	2	-1	-1	4	8	6	7	4	9	10	6	7
3	7	525111	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

0=NO INCREASE ABOVE USUAL TIME
-1=CANNOT DO IT AT ALL
9990=NO REPLY
9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

COMBAT :N
ARTILL. COMBAT:N
#SUPERVISED :>50

CREW TASKS

APPENDIX A TASKS

[illegible]

USUAL TIME, SEC 15 20

5

357

On 11/1/2017

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 9990=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA
 GRADE : TANK COMMANDER : 77 : 1
 MOS : 119F : 75 : 2
 IN ARM : 1 YR : 75 : 2
 IN ARTILLERY : 1 YR : 75 : 2
 WHEN :
 COMBAT : 20
 ANTL. CORRECTION : 20
 #SUPERVISED : 20

CREW TASKS

ORDINARY TASKS

CREW	PUMP	CON	CLIMB	STAIRS	LIFT	CLIMB	WALK	LIFT	BOXES	OPEN	LOCK	TANK COMMANDER				GUNNER			LOADER		DR		
												ISSUE	RANGE	DEP	ISSUE	IDENT	AIM	FIRE	CORR	ARM		LOAD	APM
													PIPE	CHD	LAY	SURSO	CHD	IGI	APPLY	CORR	ARM	LOAD	APM
													CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD	CHD
													MULTIPLIED										
3 12 411111	3	60	30	15	10	25	30	30	30	30	30	10	25	10	10	25	12	12	12	5	20	A	
3 12 512031	3	25	30	15	10	20	25	25	25	25	25	10	0	0	0	0	0	0	5	5	5	0	
3 12 114111	3	20	25	10	10	20	25	25	25	25	25	8	10	7	6	5	12	10	5	5	5	A	
3 12 513111	3	20	25	10	10	15	25	25	25	25	25	5	10	6	8	4	10	10	5	10	20	7	
3 12 213111	3	20	25	10	10	15	25	25	25	25	25	8	10	6	8	4	10	15	10	10	10	10	
3 12 413111	3	25	30	10	11	5	10	10	10	10	10	8	10	8	10	8	15	15	10	10	20	10	
3 12 311111	3	20	30	15	15	10	30	30	30	30	30	5	10	6	8	5	12	10	5	10	10	A	
3 12 313111	3	20	30	20	20	15	25	25	25	25	25	8	15	10	10	10	12	14	10	10	10	A	
3 12 515221	3	20	30	5	5	5	5	5	5	5	5	15	20	15	10	10	12	14	10	10	10	10	
3 12 414112	3	30	30	30	30	30	30	30	30	30	30	10	20	12	12	10	12	14	10	10	10	10	
3 12 515111	3	30	30	30	30	30	30	30	30	30	30	10	15	20	10	15	20	25	10	25	15	A	
3 12 112111	3	30	30	30	30	30	30	30	30	30	30	10	0	0	0	5	12	9	5	10	10	A	
3 12 514111	3	30	30	30	30	30	30	30	30	30	30	10	12	15	8	5	12	14	10	20	12	A	
3 12 315112	3	30	30	30	30	30	30	30	30	30	30	8	12	15	8	5	12	14	10	20	12	A	
3 12 515113	3	30	30	30	30	30	30	30	30	30	30	12	20	15	22	10	21	20	10	22	15	A	
3 12 125111	3	30	30	30	30	30	30	30	30	30	30	12	18	15	21	9	12	14	5	10	21	A	
3 12 312531	3	30	30	30	30	30	30	30	30	30	30	9	19	21	15	15	18	21	10	21	15	A	
3 12 115111	3	30	30	30	30	30	30	30	30	30	30	12	15	20	15	20	18	14	11	21	10	A	
3 12 521111	3	30	30	30	30	30	30	30	30	30	30	5	10	10	10	10	0	0	0	10	6	A	
3 12 115121	3	30	30	30	30	30	30	30	30	30	30	10	10	12	14	12	14	15	10	10	10	12	
3 12 211111	3	30	30	30	30	30	30	30	30	30	30	12	12	14	16	10	12	14	10	10	10	A	
3 12 224111	3	30	30	30	30	30	30	30	30	30	30	8	10	6	10	5	12	8	5	10	10	A	
3 12 415114	3	30	30	30	30	30	30	30	30	30	30	10	10	6	10	5	12	8	10	12	10	A	
3 12 515114	3	30	30	30	30	30	30	30	30	30	30	12	10	6	10	5	12	13	5	15	15	A	
3 12 312111	3	30	30	30	30	30	30	30	30	30	30	8	10	6	10	6	12	14	5	12	10	A	
3 12 314112	3	30	30	30	30	30	30	30	30	30	30	8	10	7	12	8	14	13	8	12	14	A	
3 12 314113	3	30	30	30	30	30	30	30	30	30	30	20	28	20	28	20	20	20	10	25	15	A	
3 12 412111	3	30	30	30	30	30	30	30	30	30	30	8	10	12	12	9	14	13	8	16	10	A	
3 12 414111	3	30	30	30	30	30	30	30	30	30	30	10	10	12	12	10	15	30	21	25	10	A	
3 12 525111	3	30	30	30	30	30	30	30	30	30	30	11	15	12	9	10	15	21	8	20	10	A	

IN CHARGE OF A TANK PLATOON, RESPONSIBLE FOR MAIN OF VEHICLES, TRAINING AND WELFARE OF PERSONNEL

0=NO INCREASE ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

M60 TANK CREW

DEMOGRAPHIC DATA WHEN HOW LONG
 GRADE SE-7 TANK COMMANDER NO YR YR MO
 MUR 319440 GUNNER 75 7
 IN ARMY 31111 THO 72 3
 IN ARTILLERY 31111 DRIVER 71 1
 COMBAT IN
 ARTIL. CORP. #SUPERVISED :350

CREW TASKS

UNUSUAL TASKS

CREW RESP	SYMP	CON	CLIMB	STAIRS	WALK	LIFT	UPEN	TANK COMMANDER				GUNNER				LOADER		DR
								ISSUE	RANGE	DEP	ISSUE	IDENT	AIM	APPLY	ARM	LOAD	STOP	
USUAL TIME, SEC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
3 78 41111	20	30	5	30	15	25	2	7	5	6	2	0	0	0	0	0	0	
3 78 51503	20	30	2	5	5	30	4	10	5	8	3	9	9	2	7	0		
3 78 11411	20	25	2	5	5	30	0	0	0	0	0	0	0	0	10	6		
3 78 51511	20	30	2	5	5	30	4	10	5	8	3	9	9	2	10	6		
3 78 21511	0	0	5	15	10	30	0	0	0	0	0	0	0	0	0	0		
3 78 41311	0	0	5	15	10	30	0	0	0	0	0	0	0	0	0	0		
3 78 31111	0	0	5	15	10	30	0	0	0	0	0	0	0	0	0	0		
3 78 51511	0	0	5	20	10	30	0	0	0	0	0	0	0	0	0	0		
3 78 51523	0	0	5	20	10	30	0	0	0	0	0	0	0	0	0	0		
3 78 41412	20	30	2	10	5	45	5	10	6	8	2	12	14	2	10	8		
3 78 51511	0	0	5	25	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 11211	0	0	5	25	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 51411	0	0	5	25	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 51511	0	0	5	25	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 31511	0	0	5	25	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 51511	0	0	5	25	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 12311	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 31411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 51411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 11311	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 51411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 21411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 41311	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 31211	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 31411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 31411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 41211	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 41411	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		
3 78 52311	0	0	5	20	15	30	0	0	0	0	0	0	0	0	0	0		

I HAVE BEEN IN AN ANTI ARMOR PI1. TOWNS. I HAVE WORK WITH THE JEFF 100, THE M200 SYSTEM AND AT THE PRESENT TIME ON THE M901.

0=NO INCLAST ABOVE USUAL TIME
 -1=CANNOT DO IT AT ALL
 999=NO REPLY
 9=NO REPLY (FOR CONFIDENCE)

IMPROVED LOW VEHICLE CREW

DEMOGRAPHIC DATA
 GRADE : SF-A
 MOS : 111309
 IN ARMY : 10YR
 IN ARTILLERY : 10YR
 COMBAT : 10YR
 ARTIL. COMBAT : 10YR
 SQUAD LEADER : 77
 GUNNER : 70
 LOADER : 75
 DRIVER : 1
 #SUNFAVISED : 10

CREW TASKS

ORDINARY TASKS																		
CREW RESP	SYMPTOM COMP	CLIMB STAIRS	LIFT BOXES	CLIMB STAIRS	WALK	LIFT BOXES	OPEN LOCK	SELF-STIPULATED VALUES				SQUAD LEADER		GUNNER		UP START DRIVE STOP	LOADER HEADY RACK	GUNNER TARGET TRACKING ACCURACY
								60	100	100	10	DEFTG 101 DRIVER AZ	CD ELECT SLEW	SET ACQUIS ELECT SLEW	ARM FINE			
CONFIDENCE = 5																		
4	3	411111	5	25	40	1	1	20	5	20	10	25	75	90	80			
4	3	515031	5	65	60	0.5	40	-1	45	20	60	60	180	190	50			
4	3	114111	4	20	26	1	1	25	0	4	20	21	65	70	85			
4	3	515311	5	-1	-1	-1	-1	-1	50	60	60	120	-1	-1	20			
4	3	215111	4	30	50	1	1	1	25	20	30	14	40	100	80			
4	3	415111	5	20	25	2	1	3	0	4	20	21	65	66	89			
4	3	311111	4	20	26	3	2	3	0	0	0	40	70	90	90			
4	3	315111	5	17	22	1	2	4	5	3	18	22	65	65	90			
4	3	515223	5	-1	-1	-1	-1	-1	40	50	60	60	120	-1	10			
4	3	414112	4	60	120	-1	-1	-1	40	20	60	70	80	90	60			
4	3	535111	5	60	60	-1	-1	60	10	20	31	14	40	125	80			
4	3	112111	5	0	0	5	11A	10	5	0	0	0	0	0	90			
4	3	514111	4	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	90			
4	3	515112	5	-1	-1	-1	-1	-1	120	60	60	60	120	150	10			
4	3	315113	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	999			
4	3	515111	4	60	60	-1	-1	-1	60	60	60	60	120	120	90			
4	3	125111	4	25	26	5	60	25	10	0	0	0	0	0	90			
4	3	334231	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	90			
4	3	521111	5	30	40	1	60	1	5	0	0	0	0	0	80			
4	3	115121	4	35	40	-1	-1	-1	60	8	5	40	120	120	80			
4	3	211111	4	35	46	-1	-1	-1	40	8	5	40	120	120	80			
4	3	224111	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	10			
4	3	415310	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	40			
4	3	312111	5	120	140	-1	-1	-1	60	6	4	39	25	42	40			
4	3	314112	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0			
4	3	314113	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0			
4	3	412111	5	60	60	-1	-1	-1	60	8	5	40	120	120	50			
4	3	414111	4	50	40	-1	-1	-1	60	20	60	60	120	120	60			
4	3	525111	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	60			
4	3	115121	4	40	40	1	-1	-1	60	8	4	40	120	120	60			
4	3	212111	4	40	40	-1	-1	-1	60	10	4	40	120	120	60			
4	3	112151	4	35	60	1	1	1	30	5	34	14	120	120	75			
4	3	115151	4	40	40	-1	-1	-1	60	40	60	120	125	125	60			
4	3	115151	4	40	40	1	2	1	60	10	4	40	120	125	50			
4	3	214112	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	70			
4	3	314111	5	60	60	-1	-1	-1	60	15	10	60	127	130	50			
4	3	214113	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0			
4	3	114111	5	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	0			

I WAS THE INSTRUCTOR FOR 60-81 AFTER THAT I WAS SUPPLY SET AND I WORKING AS THE PLATOON SET

Appendix E

PERFORMANCE DATA INPUT VALUES FOR REGRESSION MODELING:
CREWMEMBER POSITIONS AND TASKS

Table E.1. Gun crewmember performance.

Symptom No. Complex	Crewmember Position ^a (P _k)				Crewmember Tasks ^b (P _{ik})											
	1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	
1	112111	0.813	0.816	0.788	0.690	0.813	0.843	0.790	0.852	0.672	0.496	0.806	0.678	0.722	0.744	0.744
2	113111	0.811	0.857	0.822	0.697	0.811	0.883	0.833	0.879	0.714	0.601	0.769	0.666	0.699	0.723	0.716
3	113121	0.555	0.700	0.675	0.473	0.555	0.695	0.705	0.729	0.576	0.326	0.616	0.416	0.481	0.497	0.544
4	114111	0.691	0.730	0.690	0.452	0.691	0.815	0.661	0.832	0.493	0.211	0.609	0.421	0.504	0.709	0.665
5	123111	0.642	0.707	0.670	0.502	0.642	0.735	0.682	0.756	0.530	0.353	0.592	0.445	0.490	0.596	0.588
6	211111	0.671	0.828	0.803	0.650	0.671	0.829	0.827	0.862	0.692	0.480	0.705	0.660	0.641	0.726	0.722
7	213111	0.605	0.786	0.711	0.542	0.605	0.859	0.725	0.846	0.518	0.338	0.677	0.506	0.567	0.693	0.616
8	224111	0.362	0.540	0.501	0.330	0.362	0.572	0.511	0.614	0.350	0.161	0.477	0.318	0.364	0.423	0.446
9	311111	0.696	0.873	0.832	0.653	0.696	0.921	0.829	0.915	0.687	0.407	0.760	0.649	0.679	0.793	0.778
10	312111	0.612	0.709	0.700	0.556	0.612	0.755	0.668	0.764	0.586	0.341	0.674	0.518	0.584	0.655	0.689
11	313111	0.658	0.782	0.763	0.559	0.658	0.855	0.720	0.894	0.570	0.357	0.709	0.512	0.590	0.704	0.620
12	313112	0.469	0.631	0.575	0.387	0.469	0.665	0.600	0.665	0.438	0.216	0.510	0.323	0.380	0.491	0.578
13	314112	0.394	0.509	0.479	0.344	0.394	0.535	0.486	0.596	0.329	0.223	0.400	0.248	0.376	0.469	0.492
14	314113	0.252	0.417	0.371	0.223	0.252	0.454	0.385	0.446	0.266	0.134	0.314	0.184	0.222	0.250	0.295
15	315113	0.255	0.404	0.359	0.179	0.255	0.439	0.374	0.486	0.223	0.072	0.291	0.147	0.219	0.309	0.319
16	334231	0.221	0.384	0.321	0.188	0.221	0.427	0.348	0.413	0.212	0.092	0.243	0.194	0.216	0.270	0.247
17	411111	0.530	0.731	0.749	0.565	0.530	0.848	0.643	0.877	0.550	0.315	0.769	0.572	0.547	0.809	0.642
18	412111	0.557	0.728	0.709	0.520	0.557	0.752	0.706	0.772	0.595	0.333	0.603	0.499	0.560	0.643	0.600
19	413111	0.559	0.694	0.652	0.496	0.559	0.790	0.619	0.789	0.463	0.291	0.641	0.471	0.556	0.634	0.561
20	414111	0.491	0.600	0.561	0.370	0.491	0.637	0.566	0.663	0.413	0.204	0.510	0.352	0.366	0.428	0.490
21	414112	0.368	0.535	0.490	0.295	0.368	0.603	0.480	0.646	0.313	0.113	0.480	0.294	0.405	0.513	0.452
22	415314	0.155	0.170	0.161	0.070	0.155	0.235	0.134	0.200	0.110	0.021	0.090	0.110	0.130	0.182	0.172
23	513111	0.515	0.643	0.582	0.396	0.515	0.718	0.583	0.689	0.428	0.215	0.572	0.338	0.415	0.528	0.513
24	514111	0.409	0.592	0.544	0.362	0.409	0.631	0.557	0.673	0.376	0.185	0.509	0.355	0.369	0.479	0.477
25	515223	0.289	0.399	0.361	0.134	0.289	0.452	0.358	0.484	0.227	0.039	0.253	0.156	0.224	0.312	0.316
26	515311	0.387	0.534	0.515	0.249	0.387	0.612	0.473	0.650	0.346	0.100	0.376	0.237	0.322	0.407	0.404
27	515431	0.155	0.275	0.252	0.110	0.155	0.339	0.251	0.339	0.157	0.032	0.231	0.136	0.164	0.253	0.223
28	521111	0.530	0.698	0.658	0.550	0.530	0.722	0.675	0.784	0.479	0.378	0.679	0.553	0.572	0.632	0.562
29	525111	0.287	0.406	0.370	0.228	0.287	0.431	0.385	0.439	0.270	0.106	0.275	0.197	0.329	0.306	0.394
30	535111	0.261	0.414	0.377	0.187	0.261	0.474	0.367	0.480	0.252	0.080	0.276	0.159	0.256	0.337	0.278

a 1, Chief of section; 2, gunner; 3, assistant gunner; 4, driver.

b See Table 2 for task description.

Table E.2. FDC crewmember performance.

No.	Symptom Complex	Crewmember Position ^a (P _k)			Crewmember Tasks ^b (P _{jk})							
		1	2	3	1	2	3	4	5	6	7	8
1	112111	0.906	0.798	0.867	0.887	0.896	0.934	0.794	0.783	0.823	0.875	0.826
2	113111	0.944	0.861	0.882	0.911	0.945	0.964	0.851	0.864	0.874	0.890	0.847
3	113121	0.704	0.653	0.787	0.606	0.733	0.736	0.658	0.683	0.616	0.806	0.701
4	114111	0.779	0.743	0.769	0.683	0.769	0.882	0.741	0.764	0.725	0.787	0.693
5	123111	0.779	0.693	0.731	0.767	0.760	0.821	0.683	0.728	0.676	0.752	0.641
6	211111	0.702	0.697	0.742	0.598	0.702	0.792	0.752	0.714	0.608	0.778	0.600
7	213111	0.808	0.692	0.779	0.732	0.800	0.886	0.706	0.727	0.641	0.793	0.718
8	224111	0.482	0.461	0.568	0.406	0.471	0.578	0.460	0.534	0.407	0.583	0.542
9	311111	0.778	0.674	0.763	0.685	0.803	0.805	0.686	0.690	0.642	0.793	0.641
10	312111	0.693	0.685	0.747	0.576	0.720	0.745	0.688	0.669	0.696	0.778	0.624
11	313111	0.787	0.644	0.762	0.708	0.801	0.824	0.666	0.665	0.592	0.790	0.644
12	313112	0.650	0.624	0.722	0.502	0.721	0.673	0.616	0.637	0.624	0.766	0.563
13	314112	0.549	0.558	0.662	0.455	0.570	0.594	0.563	0.572	0.538	0.703	0.513
14	314113	0.428	0.453	0.555	0.320	0.461	0.480	0.458	0.489	0.414	0.603	0.397
15	315113	0.473	0.439	0.537	0.380	0.502	0.505	0.418	0.486	0.432	0.573	0.408
16	334231	0.370	0.431	0.504	0.248	0.421	0.423	0.437	0.493	0.377	0.551	0.354
17	411111	0.697	0.672	0.725	0.584	0.717	0.760	0.674	0.763	0.598	0.759	0.593
18	412111	0.767	0.693	0.754	0.667	0.785	0.816	0.675	0.711	0.705	0.786	0.624
19	413111	0.822	0.672	0.822	0.725	0.819	0.911	0.668	0.703	0.650	0.835	0.764
20	414111	0.698	0.596	0.693	0.557	0.731	0.769	0.586	0.644	0.570	0.728	0.560
21	414112	0.627	0.569	0.649	0.504	0.658	0.886	0.573	0.617	0.522	0.689	0.503
22	415314	0.271	0.297	0.346	0.188	0.277	0.367	0.289	0.384	0.227	0.378	0.242
23	513111	0.609	0.533	0.660	0.489	0.636	0.669	0.541	0.591	0.475	0.692	0.537
24	514111	0.625	0.550	0.640	0.535	0.653	0.651	0.556	0.566	0.525	0.682	0.489
25	515223	0.424	0.350	0.441	0.331	0.416	0.543	0.342	0.398	0.324	0.486	0.301
26	515311	0.509	0.440	0.568	0.347	0.525	0.686	0.433	0.528	0.386	0.587	0.488
27	515431	0.353	0.379	0.444	0.224	0.380	0.483	0.358	0.467	0.349	0.486	0.310
28	521111	0.597	0.554	0.642	0.464	0.625	0.676	0.568	0.557	0.531	0.675	0.515
29	525111	0.494	0.467	0.558	0.382	0.513	0.573	0.472	0.525	0.415	0.600	0.413
30	535111	0.411	0.378	0.479	0.312	0.419	0.503	0.364	0.437	0.354	0.522	0.338

^a 1, Fire detection officer; 2, horizontal control operator; 3, computer.

^b See Table 2 for task description.

Table E.3. Tank crewmember performance.

Symptom Complex	Crewmember Position ^a (P _k)										Crewmember Tasks ^b (P _{jk})													
	1	2	3	4	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
1	112111	0.890	0.942	0.841	0.899	0.799	0.930	0.855	0.894	0.797	0.952	0.959	0.820	0.845	0.899	0.952	0.933	0.918	0.855	0.854	0.835	0.675	0.684	0.717
2	113111	0.902	0.925	0.836	0.910	0.788	0.951	0.864	0.905	0.771	0.933	0.945	0.829	0.838	0.910	0.933	0.918	0.855	0.854	0.835	0.675	0.684	0.717	
3	113121	0.842	0.898	0.742	0.818	0.720	0.891	0.825	0.834	0.738	0.918	0.909	0.738	0.742	0.818	0.918	0.909	0.855	0.854	0.835	0.675	0.684	0.717	
4	114111	0.685	0.799	0.594	0.672	0.528	0.716	0.609	0.772	0.566	0.855	0.802	0.588	0.595	0.672	0.855	0.802	0.772	0.566	0.854	0.835	0.675	0.684	0.717
5	123111	0.763	0.828	0.683	0.717	0.650	0.800	0.716	0.791	0.661	0.854	0.835	0.675	0.684	0.717	0.854	0.835	0.791	0.661	0.854	0.835	0.675	0.684	0.717
6	211111	0.857	0.879	0.815	0.868	0.708	0.905	0.834	0.862	0.741	0.889	0.894	0.795	0.820	0.868	0.889	0.894	0.862	0.741	0.889	0.894	0.795	0.820	0.868
7	213111	0.738	0.813	0.663	0.798	0.568	0.806	0.704	0.744	0.565	0.856	0.830	0.658	0.664	0.798	0.856	0.830	0.744	0.565	0.856	0.830	0.658	0.664	0.798
8	224111	0.567	0.655	0.518	0.624	0.422	0.628	0.519	0.588	0.478	0.688	0.662	0.591	0.506	0.624	0.688	0.662	0.588	0.478	0.688	0.662	0.591	0.506	0.624
9	311111	0.772	0.825	0.741	0.875	0.634	0.830	0.725	0.785	0.550	0.850	0.865	0.714	0.747	0.875	0.850	0.865	0.785	0.550	0.850	0.865	0.714	0.747	0.875
10	312111	0.720	0.782	0.666	0.751	0.573	0.783	0.669	0.736	0.585	0.812	0.795	0.697	0.660	0.751	0.812	0.795	0.736	0.585	0.812	0.795	0.697	0.660	0.751
11	313111	0.753	0.820	0.683	0.773	0.568	0.827	0.695	0.780	0.570	0.854	0.844	0.742	0.672	0.773	0.854	0.844	0.780	0.570	0.854	0.844	0.742	0.672	0.773
12	313112	0.523	0.629	0.444	0.576	0.303	0.605	0.473	0.578	0.375	0.682	0.648	0.519	0.432	0.576	0.682	0.648	0.578	0.375	0.682	0.648	0.519	0.432	0.576
13	314112	0.469	0.570	0.434	0.536	0.348	0.539	0.398	0.498	0.386	0.590	0.586	0.503	0.423	0.536	0.590	0.586	0.498	0.386	0.590	0.586	0.503	0.423	0.536
14	314113	0.335	0.455	0.254	0.440	0.220	0.364	0.307	0.371	0.254	0.477	0.490	0.327	0.243	0.440	0.477	0.490	0.371	0.254	0.477	0.490	0.327	0.243	0.440
15	315113	0.354	0.470	0.205	0.328	0.225	0.396	0.299	0.414	0.285	0.513	0.479	0.313	0.191	0.328	0.513	0.479	0.414	0.285	0.513	0.479	0.313	0.191	0.328
16	334231	0.317	0.434	0.335	0.390	0.192	0.375	0.278	0.341	0.305	0.454	0.443	0.400	0.324	0.390	0.454	0.443	0.341	0.305	0.454	0.443	0.400	0.324	0.390
17	411111	0.660	0.752	0.704	0.788	0.462	0.748	0.644	0.711	0.443	0.803	0.787	0.590	0.733	0.788	0.803	0.787	0.711	0.443	0.803	0.787	0.590	0.733	0.788
18	412111	0.753	0.812	0.681	0.772	0.619	0.804	0.714	0.766	0.614	0.829	0.835	0.707	0.676	0.772	0.829	0.835	0.766	0.614	0.829	0.835	0.707	0.676	0.772
19	413111	0.692	0.784	0.642	0.763	0.465	0.784	0.641	0.716	0.504	0.842	0.800	0.656	0.640	0.763	0.842	0.800	0.716	0.504	0.842	0.800	0.656	0.640	0.763
20	414111	0.633	0.717	0.521	0.635	0.479	0.687	0.598	0.651	0.496	0.741	0.744	0.589	0.509	0.635	0.741	0.744	0.651	0.496	0.741	0.744	0.589	0.509	0.635
21	414112	0.488	0.582	0.446	0.565	0.323	0.571	0.424	0.520	0.268	0.646	0.636	0.455	0.444	0.565	0.646	0.636	0.520	0.268	0.646	0.636	0.455	0.444	0.565
22	415314	0.174	0.207	0.121	0.228	0.095	0.199	0.153	0.206	0.097	0.242	0.216	0.193	0.112	0.228	0.242	0.216	0.206	0.097	0.242	0.216	0.193	0.112	0.228
23	513111	0.603	0.708	0.607	0.690	0.470	0.673	0.543	0.618	0.503	0.745	0.720	0.620	0.604	0.690	0.745	0.720	0.618	0.503	0.745	0.720	0.620	0.604	0.690
24	514111	0.488	0.645	0.492	0.635	0.304	0.577	0.424	0.526	0.371	0.697	0.674	0.476	0.495	0.635	0.697	0.674	0.526	0.371	0.697	0.674	0.476	0.495	0.635
25	515223	0.332	0.430	0.247	0.364	0.241	0.378	0.266	0.381	0.223	0.480	0.448	0.283	0.241	0.364	0.480	0.448	0.381	0.223	0.480	0.448	0.283	0.241	0.364
26	515311	0.378	0.518	0.326	0.398	0.250	0.425	0.306	0.454	0.273	0.565	0.548	0.428	0.311	0.398	0.565	0.548	0.454	0.273	0.565	0.548	0.428	0.311	0.398
27	515431	0.261	0.394	0.206	0.332	0.131	0.315	0.242	0.286	0.179	0.444	0.426	0.313	0.193	0.332	0.444	0.426	0.286	0.179	0.444	0.426	0.313	0.193	0.332
28	521111	0.563	0.643	0.544	0.652	0.436	0.628	0.512	0.573	0.477	0.663	0.658	0.548	0.543	0.652	0.663	0.658	0.573	0.477	0.663	0.658	0.548	0.543	0.652
29	525111	0.273	0.375	0.247	0.351	0.183	0.291	0.243	0.317	0.231	0.428	0.368	0.350	0.233	0.351	0.428	0.368	0.317	0.231	0.428	0.368	0.350	0.233	0.351
30	535111	0.312	0.386	0.215	0.333	0.202	0.365	0.243	0.375	0.201	0.441	0.395	0.294	0.204	0.333	0.441	0.395	0.375	0.201	0.441	0.395	0.294	0.204	0.333

^a 1, Tank commander; 2, horizontal control operator; 3, loader; 4, driver.

^b See Table 2 for task description.

Table E.4. TOW crewmember performance.

Symptom No. Complex		Crewmember Position ^a (P _k)				Crewmember Tasks ^b (P _{jk})						
		1	2	3	4	1	2	3	4	5	6	7
1	112111	0.899	0.865	0.964	0.872	0.906	0.883	0.799	0.886	0.964	0.876	0.869
2	112121	0.891	0.863	0.948	0.857	0.902	0.869	0.780	0.890	0.948	0.857	0.857
3	113111	0.868	0.830	0.917	0.882	0.871	0.860	0.758	0.853	0.917	0.874	0.890
4	113121	0.813	0.768	0.895	0.824	0.816	0.807	0.692	0.793	0.895	0.818	0.831
5	114111	0.718	0.596	0.786	0.558	0.695	0.767	0.428	0.672	0.786	0.566	0.550
6	123111	0.766	0.719	0.873	0.748	0.769	0.759	0.612	0.758	0.873	0.745	0.750
7	211111	0.879	0.853	0.945	0.876	0.882	0.873	0.801	0.869	0.945	0.864	0.888
8	213111	0.791	0.627	0.856	0.703	0.800	0.774	0.477	0.689	0.856	0.713	0.693
9	224111	0.605	0.539	0.785	0.606	0.618	0.581	0.397	0.600	0.785	0.598	0.615
10	311111	0.826	0.750	0.926	0.833	0.830	0.819	0.637	0.790	0.926	0.835	0.831
11	312111	0.710	0.638	0.854	0.765	0.735	0.664	0.507	0.689	0.854	0.769	0.760
12	313111	0.696	0.656	0.901	0.730	0.711	0.670	0.505	0.718	0.901	0.732	0.729
13	313112	0.513	0.454	0.641	0.446	0.516	0.506	0.336	0.505	0.641	0.432	0.461
14	314112	0.498	0.412	0.586	0.397	0.517	0.464	0.261	0.494	0.586	0.385	0.409
15	314113	0.402	0.316	0.455	0.207	0.408	0.390	0.196	0.384	0.455	0.197	0.219
16	315113	0.325	0.278	0.442	0.212	0.342	0.296	0.158	0.355	0.442	0.185	0.249
17	334231	0.287	0.209	0.391	0.251	0.296	0.270	0.103	0.296	0.391	0.235	0.269
18	411111	0.743	0.658	0.923	0.785	0.735	0.758	0.527	0.709	0.923	0.789	0.780
19	412111	0.770	0.750	0.893	0.756	0.781	0.747	0.642	0.787	0.893	0.758	0.755
20	413111	0.699	0.604	0.827	0.686	0.696	0.704	0.423	0.687	0.827	0.681	0.691
21	414111	0.648	0.545	0.741	0.525	0.653	0.639	0.393	0.612	0.741	0.530	0.521
22	414112	0.495	0.415	0.586	0.398	0.499	0.488	0.248	0.514	0.586	0.383	0.414
23	415314	0.211	0.180	0.301	0.130	0.203	0.228	0.104	0.228	0.301	0.130	0.131
24	513111	0.592	0.511	0.729	0.567	0.629	0.531	0.362	0.580	0.729	0.570	0.565
25	514111	0.542	0.467	0.700	0.468	0.553	0.522	0.315	0.542	0.700	0.458	0.479
26	515223	0.318	0.170	0.315	0.136	0.296	0.371	0.075	0.265	0.315	0.117	0.161
27	515311	0.402	0.282	0.530	0.235	0.399	0.409	0.145	0.387	0.530	0.208	0.269
28	515431	0.267	0.179	0.344	0.168	0.256	0.292	0.079	0.280	0.344	0.152	0.188
29	521111	0.722	0.633	0.776	0.687	0.737	0.693	0.515	0.677	0.776	0.682	0.692
30	525111	0.378	0.337	0.468	0.174	0.397	0.344	0.196	0.424	0.468	0.170	0.178
31	535111	0.365	0.287	0.457	0.233	0.371	0.353	0.174	0.351	0.457	0.227	0.240
32	111121	0.934	0.914	0.973	0.930	0.940	0.921	0.873	0.926	0.973	0.921	0.939
33	111131	0.676	0.613	0.780	0.699	0.682	0.663	0.472	0.670	0.780	0.692	0.706
34	112131	0.615	0.557	0.771	0.620	0.631	0.586	0.400	0.628	0.771	0.618	0.623
35	113131	0.648	0.576	0.753	0.628	0.672	0.604	0.444	0.629	0.753	0.632	0.624
36	114112	0.489	0.425	0.528	0.344	0.496	0.477	0.288	0.492	0.528	0.326	0.365
37	212111	0.833	0.742	0.882	0.788	0.844	0.814	0.669	0.766	0.882	0.793	0.783
38	214112	0.452	0.416	0.574	0.377	0.459	0.438	0.274	0.489	0.574	0.376	0.378
39	214113	0.343	0.256	0.455	0.191	0.347	0.335	0.146	0.325	0.455	0.185	0.198
40	314111	0.580	0.491	0.701	0.501	0.585	0.570	0.339	0.563	0.701	0.507	0.494

^a 1, Squad leader; 2, gunner; 3, driver; 4, loader.^b See Table 2 for task description.

Appendix F

PERFORMANCE-DATA REGRESSION MODELING

G. Hall

INTRODUCTION

This appendix addresses the problem of fitting linear regression models to data, focusing on the task of fitting least squares regression equations and assessing the accuracy of the fit. Most basic texts describe the general least squares model and the methodology used to obtain, for example, regression parameter estimates, standard errors, Student's *t*-statistics, and the analysis of variance table (e.g., Cook and Weisberg [1982], Draper and Smith [1982], Daniel and Wood [1980], Mosteller and Tukey [1977], and Seber [1977]). Although a review is provided here, we assume some familiarity with least squares models.

We discuss how to select and develop models that fit the data well, how to use regression diagnostics to detect model anomalies (e.g., outliers, leverage points), and what to do about them. We address multicollinearity, correlation among model error terms, and transformation of the response and factor variables.

GENERAL LINEAR MODEL

Assume a data set of n observations or cases, where the i th case consists of an observation of a response variable y_i and measures of p' explanatory (factor) variables $x_{i1}, x_{i2}, \dots, x_{ip'}$. Let x_i be the vector $x_i' = (1, x_{i1}, \dots, x_{ip'})$ and $p = p' + 1$. We assume that the response variable y_i is related to the factor variables x_i by a model of the form

$$y_i = G(x_i; \beta; \epsilon_i), \quad (\text{F.1a})$$

where the functional form of G is specified, β is a vector of unknown parameters to be estimated from the data, and ϵ_i is an *unobservable* random error. More generally, the left-hand side of Eq. (F.1a) may be replaced by a function $F(y)$ of y ; that is, we may have

$$F(y_i) = G(x_i; \beta; \epsilon_i) , \quad (F.1b)$$

where, for example, $F(\cdot)$ could be

$$F(y) = \log y , \quad (F.2a)$$

$$F(y) = \log \left(\frac{y}{1-y} \right) , \quad (F.2b)$$

$$F(y) = y^{1/2} , \quad (F.2c)$$

$$F(y) = \frac{y^\lambda - 1}{\lambda} , \quad \text{some } \lambda . \quad (F.2d)$$

Choice of a transformation F is discussed below (pp. 384-386). For now, we assume $F(y) = y$.

Faced with the choice of specifying a form for G , and lacking any theoretical considerations that might suggest one, we initially assume that G is of the form

$$G(x_i; \beta; \epsilon_i) = x_i' \beta + \epsilon_i .$$

Thus the model is

$$\begin{aligned} y_i &= x_i' \beta + \epsilon_i \\ &= \sum_{j=0}^{p'} x_{ij} \beta_j + \epsilon_i , \end{aligned} \quad (F.3)$$

where $\beta' = (\beta_0, \beta_1, \dots, \beta_{p'})$ is an unknown vector of regression parameters to be estimated from the data and ϵ_i is an unobservable random error term.

In matrix notation, let Y be the $n \times 1$ vector of responses:

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} .$$

Let X be the $(n \times p)$ factor matrix whose i th row is x_i :

$$X = \begin{bmatrix} 1, x_{11}, \dots, x_{1p} \\ 1, x_{21}, \dots, x_{2p} \\ \vdots \\ 1, x_{n1}, \dots, x_{np} \end{bmatrix} .$$

Finally, let ϵ be the $n \times 1$ vector of unobservable error terms.

Then the linear model relating the response Y to the factor matrix X is

$$Y = X\beta + \epsilon . \quad (F.4)$$

The model is termed *linear* because it is linear in the regression vector β . If the model were, say,

$$y_i = e^{x_i' \beta} + \epsilon_i , \quad (F.5)$$

then it would be nonlinear because it is nonlinear in β . If some variables in X were nonlinear functions of other variables in X , the model would still be linear as long as Eq. (F.4) is the assumed model. For example, if X contains quadratic and cross-product terms involving other factor variables, Eq. (F.4) would still yield a linear model.

In addition to Eq. (F.4), the usual modeling assumptions are as follows:

1. $E\epsilon_i = 0$ (appropriate model).
2. The unobservable error terms $\epsilon_1, \epsilon_2, \dots, \epsilon_n$ all have the same variance, $\text{var}(\epsilon_i) = \sigma^2$.
3. The error terms are uncorrelated, $\text{cov}(\epsilon_i, \epsilon_l) = 0, i \neq l$.
4. The error in measuring x is small relative to $\text{var} \epsilon_i$.
5. The error terms ϵ and factor variables X are uncorrelated.
6. The error terms ϵ_i are approximately normally distributed.

In the model developed here, assumptions 1, 4, and 5 are always true.

Standard least squares regression references show that the least squares estimate for β is

$$\hat{\beta} = (X'X)^{-1}X'Y, \quad (\text{F.6})$$

and the estimate for the variance σ^2 of the error term is

$$\hat{\sigma}^2 = \frac{1}{n-p} \sum_{i=1}^n (y_i - \hat{y}_i)^2, \quad (\text{F.7})$$

where \hat{y}_i is the prediction of y_i ,

$$y_i = x_i' \hat{\beta},$$

and $e_i = y_i - \hat{y}_i$ is the i th residual. The vector of predictions \hat{Y} is $\hat{Y} = X\hat{\beta}$ and the vector of residuals is $e = Y - \hat{Y}$. Least squares methodology selects $\hat{\beta}$ to minimize the vector inner product

$$e'e = (Y - X\hat{\beta})'(Y - X\hat{\beta})$$

$$= \sum_{i=1}^n (y_i - x_i' \hat{\beta})^2.$$

Since

$$\hat{\beta} = (X'X)^{-1}X'Y ,$$

then

$$\begin{aligned}\hat{Y} &= X\hat{\beta} \\ &= X(X'X)^{-1}X'Y .\end{aligned}$$

Thus, if

$$H = X(X'X)^{-1}X' ,$$

then

$$\begin{aligned}\hat{Y} &= HY , \\ e &= Y - \hat{Y} \\ &= (I - H)Y .\end{aligned}$$

The matrix H is both symmetric ($H' = H$) and idempotent ($H^2 = H$), and is the linear transformation that orthogonally projects any n vector onto the space spanned by the columns of X .

Since the linear model is $Y = X\beta + \epsilon$ and $(I - H)X\beta = 0$, we compute

$$\begin{aligned}e &= (I - H)Y \\ &= (I - H)(X\beta + \epsilon) \\ &= (I - H)\epsilon .\end{aligned}$$

Then, if $H = (h_{ij})$, in scalar form we have

$$e_i = \epsilon_i - \sum_{j=1}^n h_{ij} \epsilon_j .$$

Thus the relationship between the unobservable model errors (ϵ_i) and the computed residuals (e_i) depends solely on $H = X(X'X)^{-1}X'$ --i.e., on the factor variables. If all the h_{ij} are sufficiently small, e will serve as a reasonable substitute for ϵ ; otherwise, the usefulness of e may be limited.

Returning to Eq. (F.6), we reexpress $\hat{\beta}$ as

$$\begin{aligned} \hat{\beta} &= (X'X)^{-1}X'Y \\ &= (X'X)^{-1}X'(X\beta + \epsilon) \\ &= \beta + (X'X)^{-1}X'\epsilon . \end{aligned}$$

Thus, since we assumed that $E\epsilon = 0$, the expected value $E\hat{\beta}$ of $\hat{\beta}$ is

$$\begin{aligned} E\hat{\beta} &= \beta + (X'X)^{-1}X'E\epsilon \\ &= \beta . \end{aligned} \tag{F.8}$$

That is, $\hat{\beta}$ is an unbiased estimate of β , whether or not the error terms ϵ have constant variance σ^2 , are uncorrelated, or are normally distributed. It is still essential that X and ϵ be uncorrelated. The estimate $\hat{\sigma}^2$ of σ^2 , however, is affected by violation of the model assumptions, as discussed below (pp. 19-25).

Since $\hat{\beta} = \beta + (X'X)^{-1}X'\epsilon$, if it is assumed that $\text{var } \epsilon = \sigma^2 I$, where I is the $n \times n$ identity matrix (i.e., the error terms ϵ_i have the same constant variance σ^2 and are uncorrelated), then

$$\begin{aligned}
\text{var } \hat{\beta} &= \text{var } [(X'X)^{-1}X'\epsilon] \\
&= (X'X)^{-1}X' (\text{var } \epsilon) X(X'X)^{-1} \\
&= \sigma^2 (X'X)^{-1} .
\end{aligned}
\tag{F.9}$$

Equation (F.9) is the expression for the variance/covariance matrix of $\hat{\beta}$. The corresponding estimated variance/covariance matrix is $\hat{\sigma}^2(X'X)^{-1}$.

Again, if it is not the case that $\text{var } \epsilon = \sigma^2 I$ (if, for example, $\text{var } \epsilon = \sigma^2 V$, where V is not the identity matrix I), then Eq. (F.9) will give an incorrect assessment of the variance of $\hat{\beta}$.

Typical Output from Regression Package

In addition to providing the estimates $\hat{\beta}$ of β and $\hat{\sigma}^2$ of σ^2 , current computer packages also provide the standard errors (standard deviations) of the regression parameter estimates, the corresponding Student's t -statistics, and R^2 . These statistical parameters are described here.

Recall that the variance/covariance matrix of $\hat{\beta}$ is the $p \times p$ matrix

$$\sigma^2(X'X)^{-1} ,$$

and its estimate is $\hat{\sigma}^2(X'X)^{-1}$. For each j , $1 \leq j \leq p$, the standard error of the estimate $\hat{\beta}_j$ --i.e., its standard deviation--is the square root of the j th diagonal element,

$$\hat{\sigma} \sqrt{[(X'X)^{-1}]_{jj}} .$$

We denote this as $\hat{\sigma}_{\beta_j}$.

The corresponding Student's t -statistic for $\hat{\beta}_j$ is

$$t_j = \frac{\hat{\beta}_j}{\hat{\sigma}_{\beta_j}} .$$

This statistic is used to test the null hypothesis $H_0: \beta_j = 0$ against the alternative $H_A: \beta_j \neq 0$. The statistic is Student's t , with $n - p$ degrees of freedom. If $t(n - p, 1 - \alpha/2)$ is the value for which $\alpha/2$ percent of the t distribution is greater than $t(n - p, 1 - \alpha/2)$ [and, by symmetry, $\alpha/2$ percent less than $-t(n - p, 1 - \alpha/2)$] and if

$$|t_j| \geq t(n - p, 1 - \frac{\alpha}{2}),$$

then H_0 is rejected in favor of H_A . Generally, for $n - p \geq 12$, $t(n - p, 1 - \alpha/2) \approx 2.0$.

One global measure of the precision of the estimated regression is the multiple correlation coefficient R^2 . To derive R^2 , note that the i th residual e_i may be written

$$\begin{aligned} e_i &= y_i - \hat{y}_i \\ &= y_i - \bar{y} - (\hat{y}_i - \bar{y}). \end{aligned}$$

Taking the square and summing over the n cases, we obtain [Draper and Smith, 1981]

$$\sum_i e_i^2 = \sum_i (y_i - \bar{y})^2 - \sum_i (\hat{y}_i - \bar{y})^2$$

or

$$\sum (y_i - \bar{y})^2 = \sum e_i^2 + \sum (\hat{y}_i - \bar{y})^2.$$

The left-hand side is referred to as the sum of squares about the mean, or the corrected sum of the squares of y . Since e_i is the i th residual and $\hat{y}_i - \bar{y}$ is the deviation of the i th predicted value \hat{y}_i from the mean, this equation says that

$$\begin{array}{l} \text{Sum of squares} \\ \text{about the mean} \end{array} = \begin{array}{l} \text{Sum of squares} \\ \text{about regression} \end{array} + \begin{array}{l} \text{Sum of squares} \\ \text{due to regression} \end{array}.$$

Thus, some of the variation in y about the mean can be ascribed to the regression and some, $\sum e_i^2$, to the fact that not all of the observed y_i lie on the regression line.

Now $\sum (y_i - \bar{y})^2$ is fixed, since it is a function of the observed data. The sums $\sum e_i^2$ and $\sum (\hat{y}_i - \bar{y})^2$ depend on the model chosen (the form of the model, selection of x variables, outliers, etc.). We desire that $\sum e_i^2$, the sum of squared residuals, be small. Dividing both sides of the identity by $\sum (y_i - \bar{y})^2$, we obtain

$$1 = \frac{\sum e_i^2}{\sum (y_i - \bar{y})^2} + \frac{\sum (\hat{y}_i - \bar{y})^2}{\sum (y_i - \bar{y})^2}.$$

Thus, the model may be regarded as "good" if R^2 is near unity, which is given as

$$\begin{aligned} R^2 &= \frac{\sum (\hat{y}_i - \bar{y})^2}{\sum (y_i - \bar{y})^2} \\ &= 1 - \frac{\sum e_i^2}{\sum (y_i - \bar{y})^2}. \end{aligned}$$

Note that $0 \leq R^2 \leq 1$, always.

However, as seen below (p. 384), R^2 is not the only measure of the accuracy of the model. It should also be noted that the sum $\sum (y_i - \bar{y})^2$ has $n - 1$ degrees of freedom, $\sum e_i^2$ has $n - p' - 1$ degrees of freedom, and $\sum (\hat{y}_i - \bar{y})^2$ has p' degrees of freedom. Equivalently, $\sum y_i^2$ has n degrees of freedom, \bar{y}^2 has one degree of freedom, $\sum e_i^2$ has $n - p$ degrees of freedom ($p = p' + 1$), and $\sum \hat{y}_i^2$ has p degrees of freedom. The statistical parameters discussed in this subsection provide the basis for the standard analysis of variance tables from regression packages.

Confidence Bounds

Here we discuss confidence bounds for the *conditional mean* of y , given x , and bounds on a *future* observed value, given x . If $y = x'\beta + \epsilon$ and $\hat{\beta}$ is a least squares estimate of β , then, as we saw earlier,

$$\text{var } \hat{\beta} = \sigma^2 (X'X)^{-1} .$$

Thus, $x'\hat{\beta}$ is the predicted value of the conditional mean, $E(y|x) = x'\beta$, and the variance is

$$\begin{aligned} \text{var } (x'\hat{\beta}) &= x' (\text{var } \hat{\beta}) x \\ &= \sigma^2 x' (X'X)^{-1} x \\ &= \sigma^2 h , \end{aligned}$$

where

$$h = x' (X'X)^{-1} x .$$

A "two sigma" or "two standard deviation" confidence band on the conditional mean $E(y|x) = x'\beta$ is

$$(x'\hat{\beta} - 2\sigma \sqrt{h}, x'\hat{\beta} + 2\sigma \sqrt{h}) .$$

This confidence interval depends only on the uncertainty in the estimate $\hat{\beta}$ of β . If there were no uncertainty in $\hat{\beta}$, then $\text{var } (x'\hat{\beta}) = 0$ and the confidence interval would have zero width.

Regarded as a function of x , the band $[L(x), U(x)]$ provides an approximate, 95 percent confidence band on the regression surface, if $L(x) = x'\hat{\beta} - 2\sigma \sqrt{h}$, $U(x) = x'\hat{\beta} + 2\sigma \sqrt{h}$.

A related, but different problem is that of predicting an actual response y , given a new x . The prediction of the observed $y = x'\beta + \epsilon$ is $x'\hat{\beta}$, but its variance is new

$$\text{var } (x'\hat{\beta} + \epsilon) = \text{var } (x'\hat{\beta}) + \text{var } \epsilon$$

$$= \sigma^2 h + \sigma^2$$

$$= \sigma^2(1 + h) .$$

Thus, the upper and lower 95 percent confidence bounds on a future observed value are

$$L_0 = x'\hat{\beta} - 2\sigma \sqrt{1 + h} ,$$

$$U_0 = x'\hat{\beta} + 2\sigma \sqrt{1 + h} ,$$

which can be much wider than the earlier interval, if $h \ll 1$. For the actual data, the interval (U_0, L_0) should contain roughly 95 percent of the observed values of y , whereas $[L(x), U(x)]$ will contain a much smaller percentage.

REGRESSION DIAGNOSTICS

This section discusses various diagnostics used for assessing the accuracy of linear regression models. The diagnostics include two basic components, described above (p. 373). The two basic building blocks for assessing accuracy are

1. The computed residuals,

$$\begin{aligned} e &= Y - \hat{Y} \\ &= (I - H)Y . \end{aligned}$$

2. The Tukey hat matrix H ,

$$H = X(X'X)^{-1}X' .$$

The i th elements of the two building blocks are, respectively,

$$1. \quad e_i = y_i - \hat{y}_i \\ = y_i - x_i' \hat{\beta} ,$$

$$2. \quad h_{ij} = x_i' (X'X)^{-1} x_j , \quad 1 \leq j \leq n .$$

All commonly used current regression diagnostics are based on these two quantities or slight modifications. Among the most useful of diagnostics using residuals are

1. The residuals $e_i = y_i - \hat{y}_i$ themselves, which can be used in
 - Plot e_i versus \hat{y}_i .
 - Plot e_i versus each individual x_{ij} .
 - Plot e_i against other variables left out of the model.

Unfortunately, $\text{var } e_i = \sigma^2(1 - h_{ii})$, so these residuals do not have constant variance.

2. The internal studentized residuals,

$$r_i = \frac{e_i}{\hat{\sigma} \sqrt{1 - h_{ii}}} .$$

Unlike the ordinary residuals in diagnostic 1, the r_i have common constant variance 1. Therefore, the plots mentioned in diagnostic 1, using the r_i rather than the e_i , are more useful. Normal probability plots of the r_i plotted on normal probability paper are also more useful for assessing normality than plots of the e_i .

Residuals are also used to discover which cases [i.e., pairs (x_i, y_i)] are outliers in the response space Y , i.e., cases for which $e_i = y_i - x_i' \hat{\beta}$ is large. But if $|e_i|$ is large, does case i have a significant effect on the estimates $\hat{\beta}$ and/or $\hat{\sigma}$? What would happen if the i th case were removed from the data base (as is frequently done with

outliers)? If $\hat{\beta}_{(i)}$ and $\hat{\sigma}_{(i)}$ are the estimates of β and σ with case i removed, how different are $\hat{\beta}_{(i)}$ and $\hat{\beta}$, $\hat{\sigma}_{(i)}$ and $\hat{\sigma}$?

The answers to those questions depend in part on the position of x_i in the factor (explanatory variable) space. Ultimately, they depend on the hat matrix H . Recall that $H = X(X'X)^{-1}X'$ is an idempotent symmetric projection matrix, and that

$$\hat{Y} = HY,$$

$$e = (I - H)Y$$

$$= (I - H)\epsilon .$$

Since $(I - H)H = 0$ (idempotency), the predicted value \hat{Y} and the residuals e are orthogonal.

Also, since H is idempotent and symmetric, it follows that

$$\text{tr}(H) = \text{rank}(H) = p ,$$

$$\sum_{j=1}^n h_{ij}^2 = h_{ii} .$$

Note that

$$\text{tr}(H) = \sum_{i=1}^n h_{ii} .$$

Moreover, it can be shown [Cook and Weisberg, 1982] that, if c is the number of times the i th row of X -- x_i' --is replicated, then

$$\frac{1}{n} \leq h_{ii} \leq \frac{1}{c} .$$

For the IDP regression analysis, each row is replicated only once, so

$$\frac{1}{n} \leq h_{ii} \leq 1.$$

Since

$$\sum_{i=1}^n h_{ii} = p,$$

then

$$\frac{1}{n} \sum_{i=1}^n h_{ii} = \frac{p}{n} = h,$$

the average. Recall that $\text{var } e_i = \sigma^2(1 - h_{ii})$. Thus, if $h_{ii} = 1$, then $\text{var } e_i = 0$, so $\hat{y}_i = y_i$ --i.e., the i th case is fitted perfectly. Such extreme cases are rare but possible. The farther a value h_{ii} is from the average p/n toward 1, the more influential is the i th case on the estimates $\hat{\beta}$ and $\hat{\sigma}$. For the models selected in the Intermediate Dose Program, $p = 7$ and $n = 30$, so $h = p/n \cong 0.23$. But there are three cases (symptom complexes 16, 22, 27) for which h_{ii} is greater than 0.6. Those cases are high-leverage points. Thus, the residuals e_i and r_i are measures of outliers in the response space Y , and high-leverage points are measured by the diagonal elements h_{ii} of the Tukey hat matrix $H = X(X'X)^{-1}X'$, which depends only on the factor variable matrix X . The elements $\{h_{ii}\}$ are a measure of how far out in the factor space X each factor variable x_i lies.

A third class of diagnostics combines measures of extremeness in the response space Y with measures of extremeness in the factor space X . These are referred to as influence diagnostics or influence measures. As mentioned earlier, a case i is important or influential if deletion of case i from the data base causes a significant shift in the estimate of β . Letting

$\hat{\beta}$ = estimate of β based on full data set ,

$\hat{\beta}_{(i)}$ = estimate of β with i th case deleted ,

we seek the difference

$$\Delta\beta_{(i)} = \hat{\beta}_{(i)} - \hat{\beta} , \quad 1 \leq i \leq n .$$

If $\Delta\beta_i$ is large relative to some suitable scale, then case i is deemed influential and should be examined to see if something unique or unusual might justify its permanent exclusion from the data base.

Alternatively, the relationship between y and x may be somehow different from the model specification in a neighborhood of the case (x_i, y_i) . Consequently, we seek a suitable norm, $\|\Delta\beta_i\|$, to assess the significance of $\Delta\beta_i$. Since $\Delta\beta_i$ is a p -dimensional vector, from vector-space theory a general class of useful norms is determined by a symmetric, positive semidefinite $p \times p$ matrix M and a positive scale factor c :

$$\begin{aligned} \|\Delta\beta_i\| &= D_i(M, c) \\ &= \frac{(\Delta\beta_i') M (\Delta\beta_i)}{c} \\ &= \frac{(\hat{\beta}_{(i)} - \hat{\beta})' M (\hat{\beta}_{(i)} - \hat{\beta})}{c} . \end{aligned}$$

One of the most useful choices is $M = X'X$ and $c = p\hat{\sigma}^2$. We obtain

$$\begin{aligned} D_i &= D_i(X'X, p\hat{\sigma}^2) \\ &= \frac{(\hat{\beta}_{(i)} - \hat{\beta}) (X'X) (\hat{\beta}_{(i)} - \hat{\beta})}{p\hat{\sigma}^2} . \end{aligned}$$

This metric norm, known as *Cook's distance*, is algebraically equivalent to

$$D_i = \frac{1}{p} \frac{r_i^2}{1 - h_{ii}},$$

where r_i are the studentized residuals and h_{ii} are the diagonal elements of the hat matrix. Case i is influential if D_i is large, and D_i is large if

1. $|r_i|$ is large and h_{ii} is moderate (an outlier in response space).
2. $|r_i|$ is moderate and h_{ii} is large (a high-leverage point in factor space).
3. Both $|r_i|$ and h_{ii} are moderately large.

The exact definition of "large" will depend on the problem, but a basis for comparison is usually obtained with D_i greater than 1, corresponding to distances between $\hat{\beta}$ and $\hat{\beta}_{(i)}$ beyond a 50 percent confidence region (using an F distribution with p and $n - p$ degrees of freedom).

In the IDP, the largest Cook's-distance values for the linear model with the six factor variables were around 0.6 to 0.7. A value of 0.6 corresponds to a 25 percent confidence ellipsoid for an F distribution with 7 and 23 degrees of freedom. Thus, none of the 30 symptom complex combinations would be considered particularly influential, indicating that the model is reasonable.

TRANSFORMING THE RESPONSE VARIABLE

When the original response variable is not normal, a transformation of it may be sufficiently close to normal to allow application of the appropriate normal theory methods. Ideally, a transformation should permit a model with constant error variance, approximately normal errors, and an easily interpreted and scientifically meaningful structure.

In the IDP, the selected response variable y is basically a ratio of two times, and is always in the closed interval $[0, 1]$, i.e., $0 \leq y \leq 1$. Thus, the response variable is restricted in range. If the usual linear model is selected, i.e.,

$$y = x'\beta + \epsilon ,$$

then it is quite possible to obtain predicted values $x'\hat{\beta}$ that lie outside the interval $[0, 1]$. Moreover, even if $x'\hat{\beta}$ were in $[0, 1]$ for values of x of practical interest, upper and lower 95 percent confidence bounds of $x'\hat{\beta}$ could still lie outside the interval. Further, if y is near 0 or 1, less variability would be expected than if y were near 0.50--that is, $\text{var } \epsilon$ should be nonconstant.

The typical transformation used to ensure the $(0, 1)$ interval is the logit transformation,

$$\text{logit } (y) = \ln \left(\frac{y}{1-y} \right) , \quad 0 < y < 1 .$$

This transformation is symmetric about the value $y = 0.5$ and roughly linear in the region $0.2 \leq y \leq 0.8$, which contains most of the IDP responses averaged over individuals. In that region, the logit model will give predicted values and upper and lower confidence bounds similar to those of the usual model, $y = x'\beta + \epsilon$. The two models will differ when y is near 0 or 1 (say, $y \leq 0.1$ or $y \geq 0.9$).

Thus, the logit model specifies that

$$y^* = \ln \left(\frac{y}{1-y} \right) = x'\beta + \epsilon ,$$

where

$$y^* = \ln \left(\frac{y}{1-y} \right)$$

is the response variable. Once the model is fitted, the predicted value of y^* is

$$\hat{y}^* = x'\hat{\beta}$$

and upper and lower 95 percent confidence bounds are

$$L_{95}^* \cong x' \hat{\beta} - 2 \sqrt{h} \hat{\sigma},$$

$$U_{95}^* \cong x' \hat{\beta} + 2 \sqrt{h} \hat{\sigma},$$

where $h = x'(X'X)^{-1}x$.

Thus, the predicted value \hat{y} for y and upper and lower confidence bounds are

$$\hat{y} = \frac{e^{\hat{y}^*}}{1 + e^{\hat{y}^*}} = \frac{e^{x' \hat{\beta}}}{1 + e^{x' \hat{\beta}}} = \frac{1}{1 + e^{-x' \hat{\beta}}},$$

$$L_{95} = \frac{e^{L^*}}{1 + e^{L^*}} = \frac{1}{1 + e^{-(x' \hat{\beta} - 2\sqrt{h}\hat{\sigma})}},$$

$$U_{95} = \frac{e^{U^*}}{1 + e^{U^*}} = \frac{1}{1 + e^{-(x' \hat{\beta} + 2\sqrt{h}\hat{\sigma})}}.$$

Hence, \hat{y} , L_{95} , and U_{95} will always be in the interval $(0, 1)$, as desired.

MULTICOLLINEARITY

Again let the linear model in matrix form be

$$Y = X\beta + \epsilon,$$

where X is an $n \times p$ matrix, the i th row ($1 \leq i \leq n$) being the factor variable (vector) for the i th case and the j th column ($1 \leq j \leq p$) corresponding to the j th explanatory variable. For the IDP, $p \geq 7$, so we allow X to contain quadratic and cross-product terms involving the original six explanatory variables.

Problems involving multicollinearity arise when one or more columns of X are nearly linear combinations of other columns of X . In that case,

$(X'X)^{-1}$ becomes unstable, since $X'X$ has rank p . If one column of X (say, j_0) is a perfect linear combination of other columns, then $X'X$ is not invertible--i.e., it is singular. In that case, the effects of the factor variable x_{j_0} on the response cannot be ascertained, since x_{j_0} is a perfect linear combination of several other factor variables.

Multicollinearity of several factor variables has the following effects on the overall regression analysis:

1. Perfect multicollinearity implies that $(X'X)$ is singular; hence, there are no unique unbiased least squares estimates of β .
2. If there is multicollinearity even though $(X'X)$ is invertible, the individual effects of the separate factor variables on the response variable cannot be reliably ascertained.
3. Estimates of variances of individual regression coefficients will be large, yielding wide confidence intervals.

Consequently, it is important to determine whether a particular regression model is adversely affected by multicollinearity. Many different measures have been proposed. Most, however, have one or more serious drawbacks. For example, examining the correlation matrix of x_1, \dots, x_p reveals only pairwise collinearity. One of the best procedures is to scale $X'X$ so as to have ones along the diagonal, then compute the ordered eigenvalues $\mu_1 \geq \mu_2 \geq \dots \geq \mu_p$ for the scaled matrix [Belsley, Kuh, and Welsch, 1980]. The j th condition index is

$$k_j = \left(\frac{\mu_1}{\mu_j} \right)^{1/2}.$$

If any k_j exceeds roughly 30, collinearity will be a problem.

For the IDP, the largest condition index was about 12.7, using the six basic symptom variables. Thus, for those six factor variables, collinearity is not a problem.

CORRELATION AMONG MODEL ERROR TERMS

Until now, we have assumed that the regression model is of the form

$$y_i = x_i' \beta + \epsilon_i, \quad 1 \leq i \leq n,$$

where $\text{cov}(\epsilon_i, \epsilon_l) = 0$, $i \neq l$ --i.e., that the model error terms are uncorrelated. For the IDP, however, since each respondent gives an answer to each symptom complex, it is reasonable to assume that each person's set of answers should be correlated--hence, that $\text{cov}(\epsilon_i, \epsilon_l) \neq 0$, for $i \neq l$.

It can be shown that, although the least squares estimate of $\hat{\beta}$ is still an unbiased estimate for β , $\hat{\sigma}^2$ is biased when there is nonzero error covariance. Assume that the model now is

$$\text{var } \epsilon_i = \sigma^2, \quad 1 \leq i \leq n,$$

$$\text{cov}(\epsilon_i, \epsilon_l) = \rho\sigma^2, \quad 1 \leq i \neq l \leq n,$$

where $0 \leq \rho \leq 1$. This model belongs to a class termed generalized least squares. If ρ is known, estimates for β and σ^2 can be obtained without too much difficulty. When ρ is unknown, maximum likelihood (ML) techniques must be used. Unfortunately, use of ML strongly depends on multivariate joint normality assumptions for large n , which cannot be justified for our data. Therefore, we resort to the alternative of computing the expected bias in $\hat{\sigma}^2$, then using a correction factor (inflation factor) to adjust for the bias.

Since the ordinary least squares (OLS) estimate of β is

$$\begin{aligned} \hat{\beta} &= (X'X)^{-1}X'Y \\ &= (X'X)^{-1}X'(X\beta + \epsilon) \\ &= \beta + (X'X)^{-1}X'\epsilon, \end{aligned}$$

and since $E\epsilon = 0$, we see that we get

$$E\hat{\beta} = \beta.$$

Thus, $\hat{\beta}$ is still unbiased. However, as we now show, the estimate $\hat{\sigma}^2$ of σ^2 is biased downward. We show that in fact

$$E\hat{\sigma}^2 = \sigma^2(1 - \rho) .$$

Recall that

$$\hat{\sigma}^2 = \frac{(Y - X\hat{\beta})'(Y - X\hat{\beta})}{n - p} .$$

Let

$$\begin{aligned} S &= (Y - X\hat{\beta})'(Y - X\hat{\beta}) \\ &= [Y - X \cdot (X'X)^{-1}X'Y]'[Y - X \cdot (X'X)^{-1}X'Y] \\ &= [(I - H)Y]'[(I - H)Y] \\ &= [(I - H)(X\beta + \epsilon)]'[(I - H)(X\beta + \epsilon)] \\ &= \epsilon'(I - H)\epsilon , \end{aligned}$$

since

$$(I - H)X = 0 \quad \text{and} \quad (I - H)^2 = I - H .$$

Letting $\mathbb{I} = \sigma^2 V = \text{cov } \epsilon$, and using a theorem from random quadratic forms [Searle, 1971], we obtain

$$\begin{aligned} ES &= \text{tr} [(I - H)\mathbb{I}] \\ &= \sigma^2 \text{tr} [(I - H)V] , \end{aligned}$$

where $\text{tr}(\cdot)$ is the trace of a matrix (i.e., the sum of its diagonal elements), and

$$V = \begin{bmatrix} 1 & \rho & \rho & \dots & \rho \\ \rho & 1 & \rho & \dots & \rho \\ \rho & \rho & 1 & \dots & \rho \\ \vdots & \vdots & \vdots & \dots & \vdots \\ \rho & \rho & \rho & \dots & 1 \end{bmatrix}$$

If $\rho = 0$, then $V = I$ (the identity matrix) and

$$ES = \sigma^2 \operatorname{tr} (I - H)$$

$$= \sigma^2 (n - p) ,$$

since

$$\operatorname{tr} I = n \quad \text{and} \quad \operatorname{tr} H = p \quad (H \text{ has rank } p) ,$$

implying that $\hat{\sigma}^2$ is unbiased. But if $\rho \neq 0$, write

$$V = I + \rho L ,$$

where

$$I = \begin{bmatrix} 1 & 0 & 0 & \dots & 0 \\ 0 & 1 & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & & \vdots \\ 0 & 0 & 0 & \dots & 1 \end{bmatrix}$$

and

$$L = \begin{bmatrix} 0 & 1 & 1 & \dots & 1 \\ 1 & 0 & 1 & \dots & 1 \\ \vdots & \vdots & \vdots & & \vdots \\ 1 & 1 & 1 & \dots & 0 \end{bmatrix}$$

Thus,

$$\begin{aligned}
 ES &= \sigma^2 \operatorname{tr} [(I - H)(I + \rho L)] \\
 &= \sigma^2 \{ \operatorname{tr} (I - H) + \rho \operatorname{tr} [(I - H)L] \} \\
 &= \sigma^2 [n - p - \rho \operatorname{tr} (HL)] ,
 \end{aligned}$$

since

$$\operatorname{tr} (I - H) = p \quad \text{and} \quad \operatorname{tr} L = 0 .$$

However,

$$H = (h_{ij}) ,$$

so

$$HL = \begin{bmatrix} \sum_{j=2}^n h_{1j} & \dots & \dots & \dots \\ \dots & \sum_{j \neq 2}^n h_{2j} & \dots & \dots \\ \dots & \dots & \sum_{j \neq 3}^n h_{3j} & \dots \\ \dots & \dots & \dots & \sum_{j \neq n}^n h_{nj} \end{bmatrix} .$$

Therefore,

$$\operatorname{tr} (HL) = \sum_{i=1}^n \sum_{j \neq i}^n h_{ij} .$$

Since

$$\sum_{i=1}^n e_i = 0 ,$$

then

$$\begin{aligned} 0 &= \text{var} \left(\sum_{i=1}^n e_i \right) \\ &= \sum_{i=1}^n \text{var } e_i + \sum_{i \neq j}^n \text{cov} (e_i, e_j) \\ &= \sigma^2 \sum_{i=1}^n (1 - h_{ii}) + \sigma^2 \sum_{i \neq j}^n (-h_{ij}) \end{aligned}$$

or

$$\sum_{i \neq j}^n h_{ij} = \sum_{i=1}^n (1 - h_{ii}) = n - p .$$

Thus,

$$\text{tr} (HL) = n - p .$$

Hence,

$$\begin{aligned} ES &= \sigma^2 [n - p - \rho(n - p)] \\ &= \sigma^2 (n - p) (1 - \rho) \end{aligned}$$

or

$$E\hat{\sigma}^2 = \sigma^2(1 - \rho) .$$

Thus, if $\hat{\sigma}^2$ is an estimate of σ^2 based on ordinary least squares and $\hat{\rho}$ is a reasonable estimate for ρ , then an inflation-factor-adjusted estimate for σ^2 is

$$\tilde{\sigma}^2 = \frac{1}{1 - \hat{\rho}} \hat{\sigma}^2$$

or

$$\tilde{\sigma} = \frac{\hat{\sigma}}{(1 - \hat{\rho})^{1/2}} .$$

Using a package from STATLIB, an estimate for ρ between 0.2 and 0.4 was obtained. Thus, the inflation (correction) factor $(1 - \hat{\rho})^{-1/2}$ varies from 1.12 to 1.30--i.e., $\hat{\sigma}$ is too low by about 10 to 30 percent.

TRANSFORMING FACTOR VARIABLES

As indicated above (p. 12), it is useful to plot the residuals (either ordinary or studentized) against each factor variable x_j . A uniform horizontal band in the individual plots indicates a satisfactory model. If, however, a residual plot against x_j displays some sort of curvature, a transformation of x_j is in order.

Further, for data like those of the IDP, it is important to determine the effect, if any, of combinations of variables as opposed to individuals. That is, cross-product effects between explanatory (factor) variables may have a greater influence on the response variable than does the appearance of either variable alone.

Thus, in addition to using the standard six variables x_1, \dots, x_6 (corresponding to upper GI, etc.), we tried to incorporate quadratic terms x_1^2, \dots, x_6^2 and cross-product terms $x_\ell x_j, 1 \leq \ell \neq j \leq 6$. Unfortunately, because there were only 30 combinations of the six symptom

complexes in the data, with little variation in the last three of the six factor variables, the analysis was beset with extreme problems caused by both multicollinearity and high-leverage cases.

Many of the quadratic and cross-product terms were found to be either exactly collinear with linear combinations of the original six variables, or so close to perfectly collinear that only one symptom complex combination of the 30 prevented exact collinearity. That is, if the one combination were removed from the data, perfect collinearity would result. Consequently, the one combination would be classed as both a high-leverage and extremely influential data point. Cook's distances of greater than 15 were observed, whereas a value of one normally causes concern. Consequently, we decided that introducing higher-order terms in the model would be fruitless, since the factor variables were so sparse in range variability. Thus, only the original six factor variables were retained.

Appendix G

PERFORMANCE PREDICTIONS FOR CREWMEMBER TASKS

This appendix gives performance data for the separate crewmember tasks. Regression parameters are also listed for fitting the performance prediction (logit) model to the task data.

Figures G.1 through G.12 are plots of crewmember separate task and position performance shown for comparison. Performance values for crewmember position, determined from the separate tasks as given in Sec. 3, lie along the straight line plotted against performance degradation $(1 - P)$. The tick marks along the top of the abscissa correspond to symptom complexes ordered as given in Tables 12 through 27 in Sec. 3. The performance plots and regression parameters are given for crewmembers who have two or more tasks; the artillery chief of section, tank driver and TOW driver are not included, since they perform a single task.

Tables G.1 through G.4 list the regression relationship parameters for fitting the task data. Like the performance prediction relationships for the crewmembers given in Sec. 3, task performance predictions are given by

$$\hat{P}_{k,j} = \frac{1}{[1 + \exp(-\mathbf{x}'_k \hat{\beta}_j)]},$$

where $\mathbf{x}'_k = (1, x_{k1}, x_{k2}, \dots, x_{k6})$ is a vector of integers ($1 \leq x_{kl} \leq 5$), denoting symptom severity level for the k th symptom complex and the l th symptom category, and $\hat{\beta}_j$ are the beta parameters given in Tables G.1 through G.4, for a particular task j .

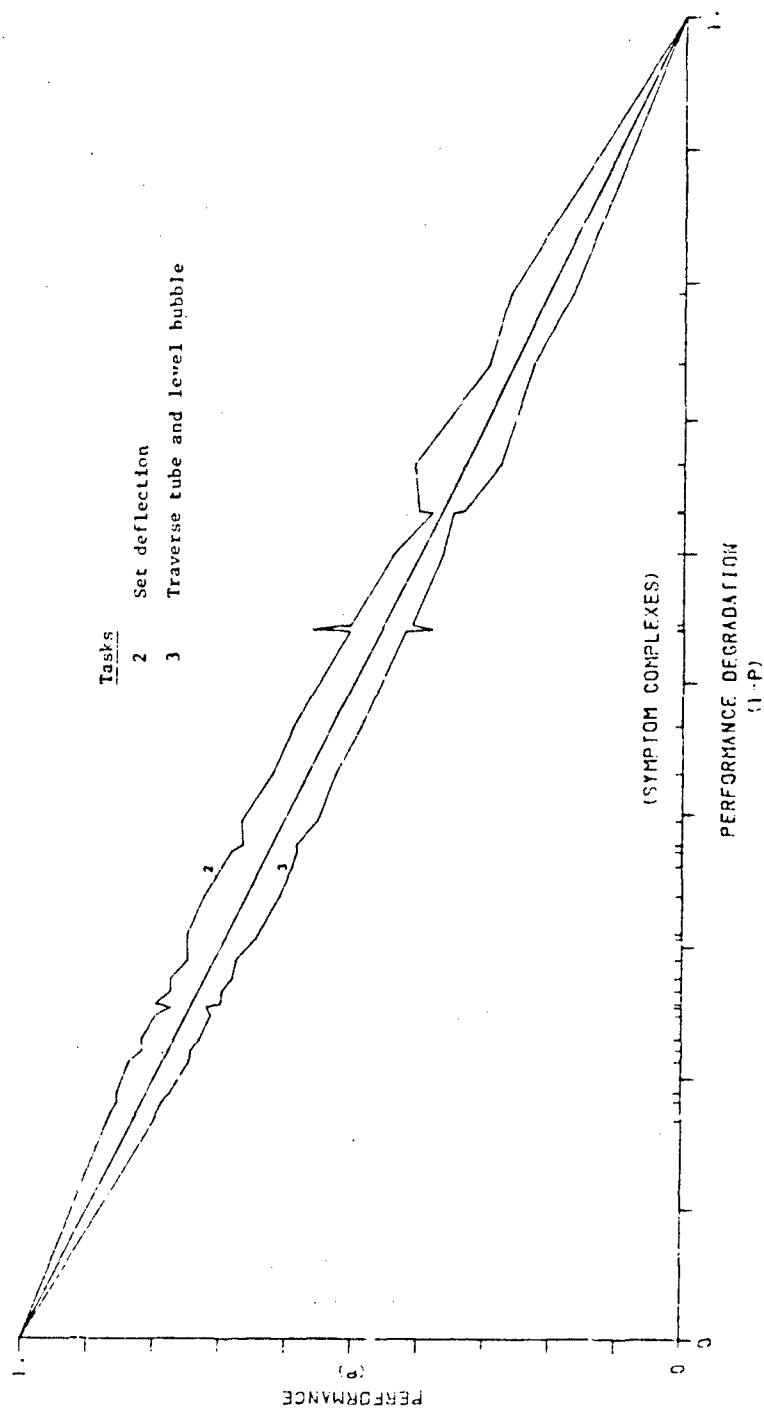


Figure G.1. Task/position performance: gun crew, gunner.

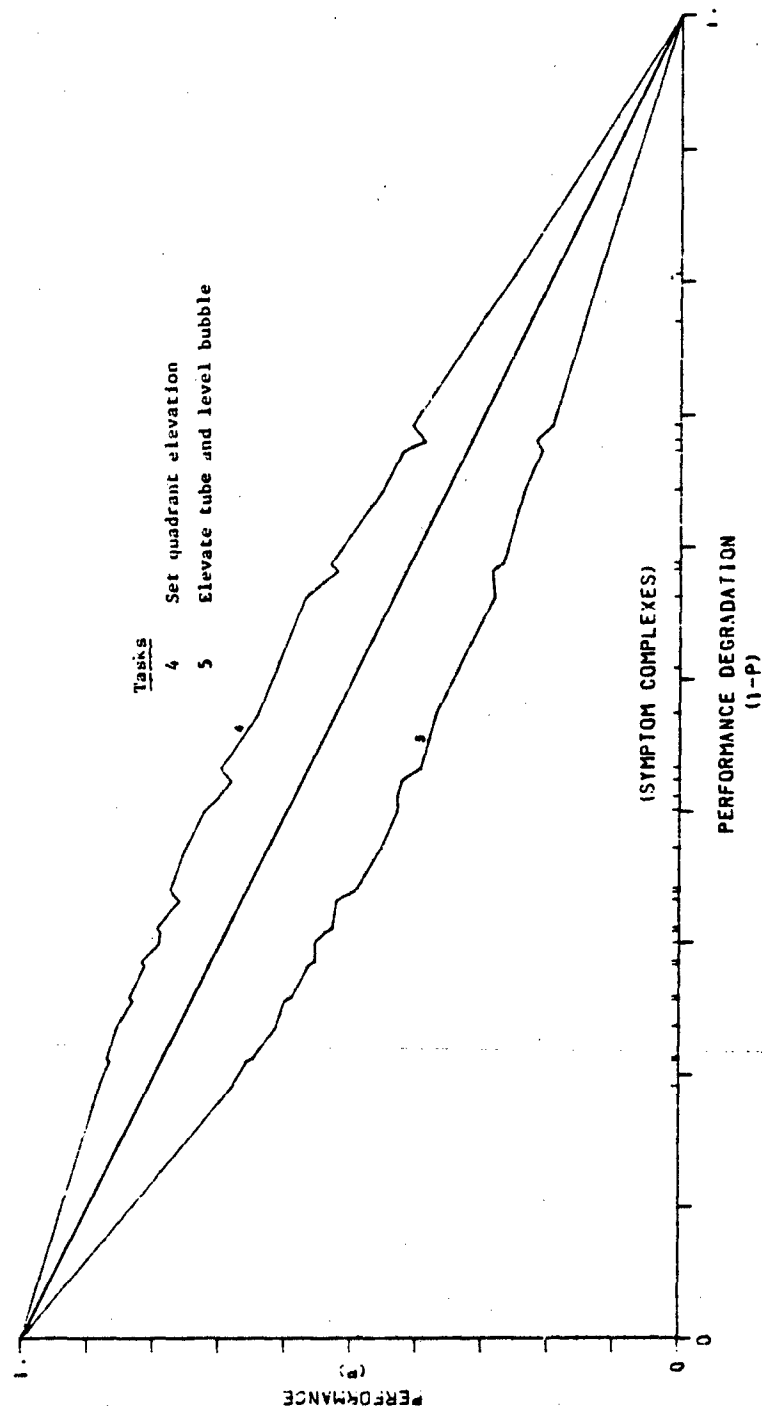


Figure G.2. Task/position performance: gun crew, assistant gunner.

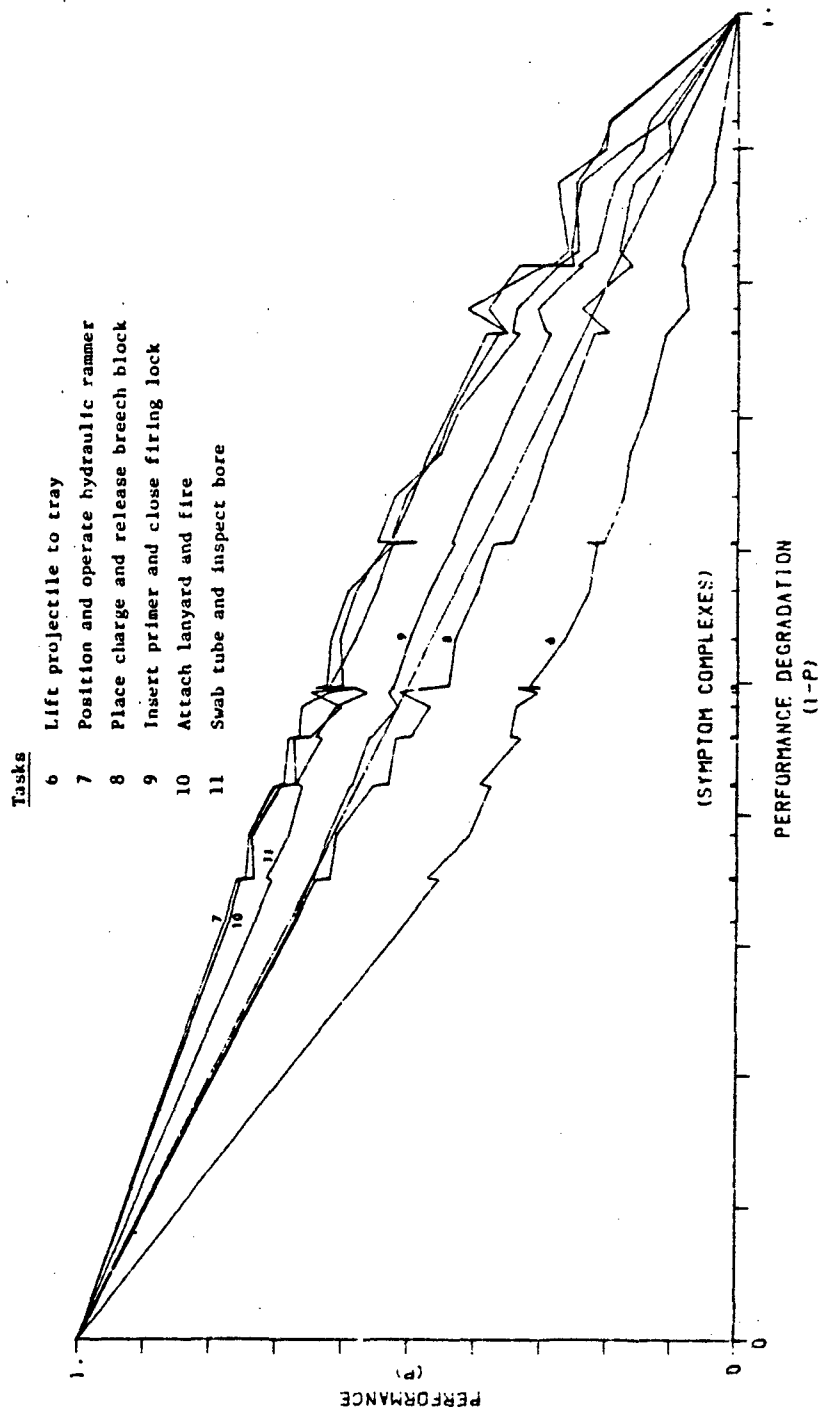


Figure G.3. Task/position performance: gun crew, loader.

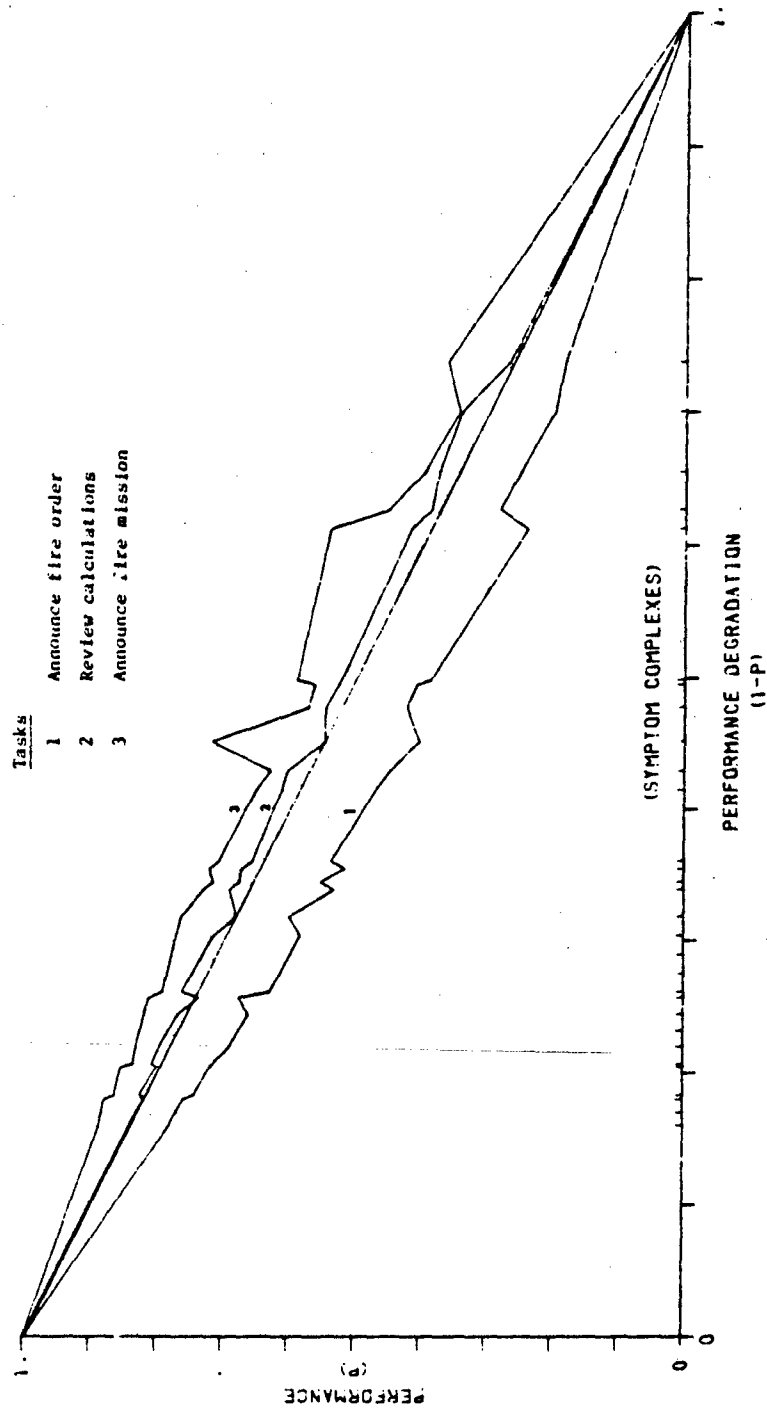


Figure G.4. Task/position performance: FDC crew, fire direction officer.

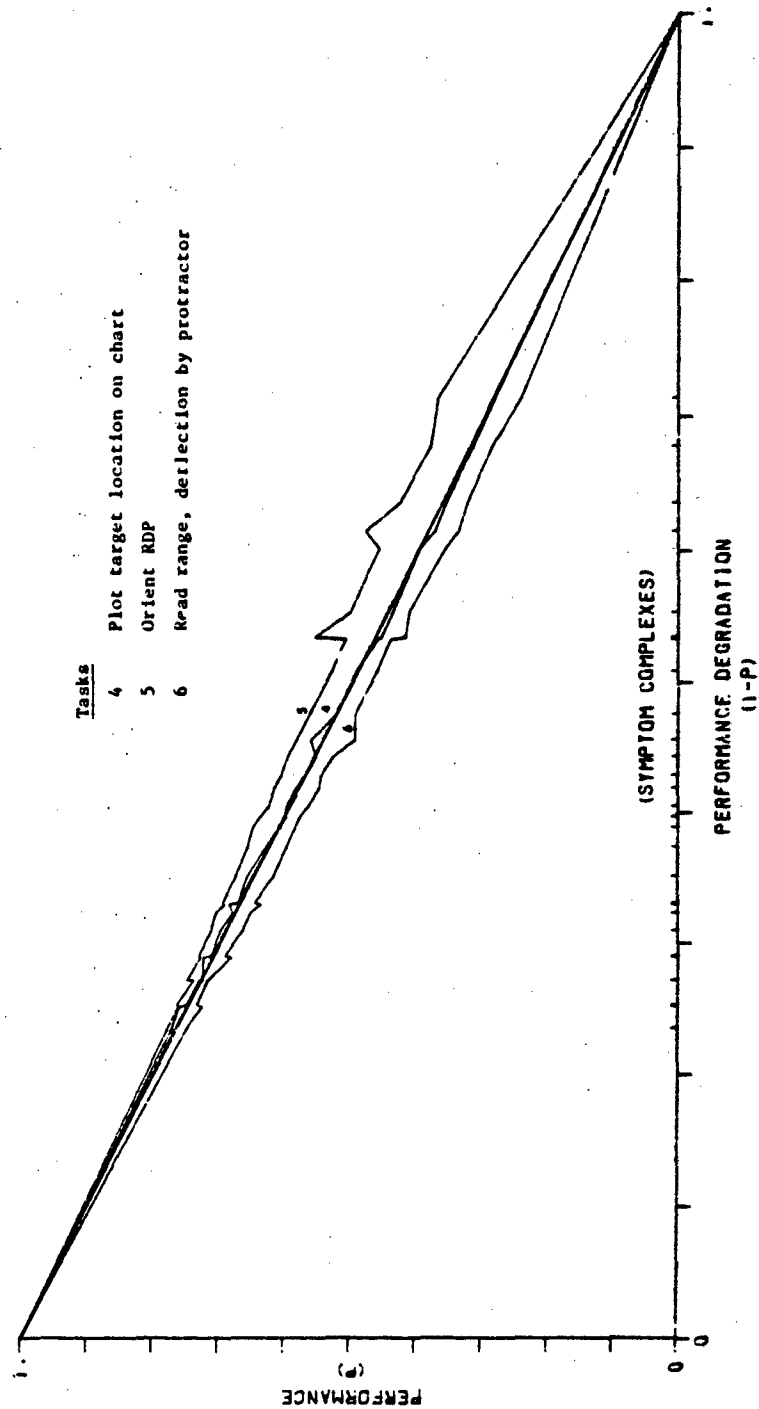


Figure G.5. Task/position performance: FDC crew, horizontal control operator.

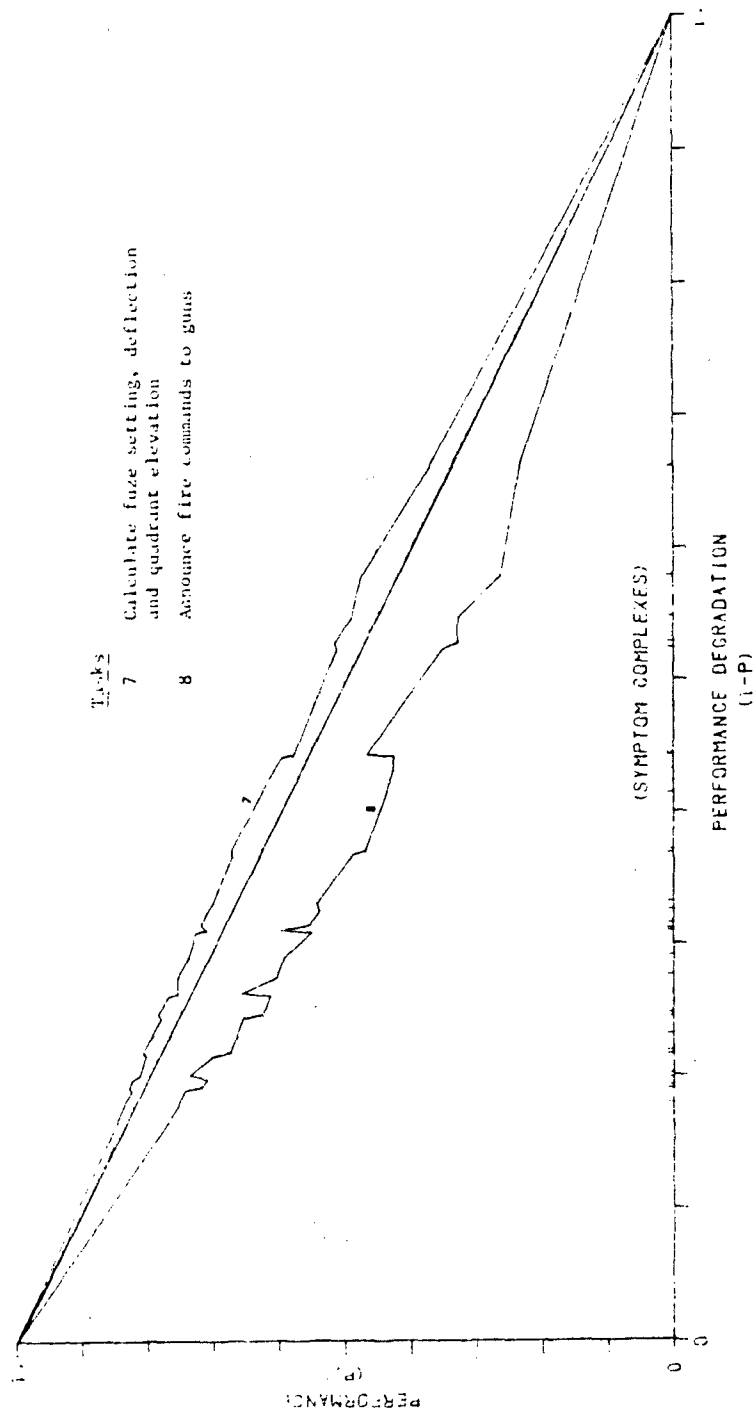


Figure G.6. Task/position performance: FDC crew, computer.

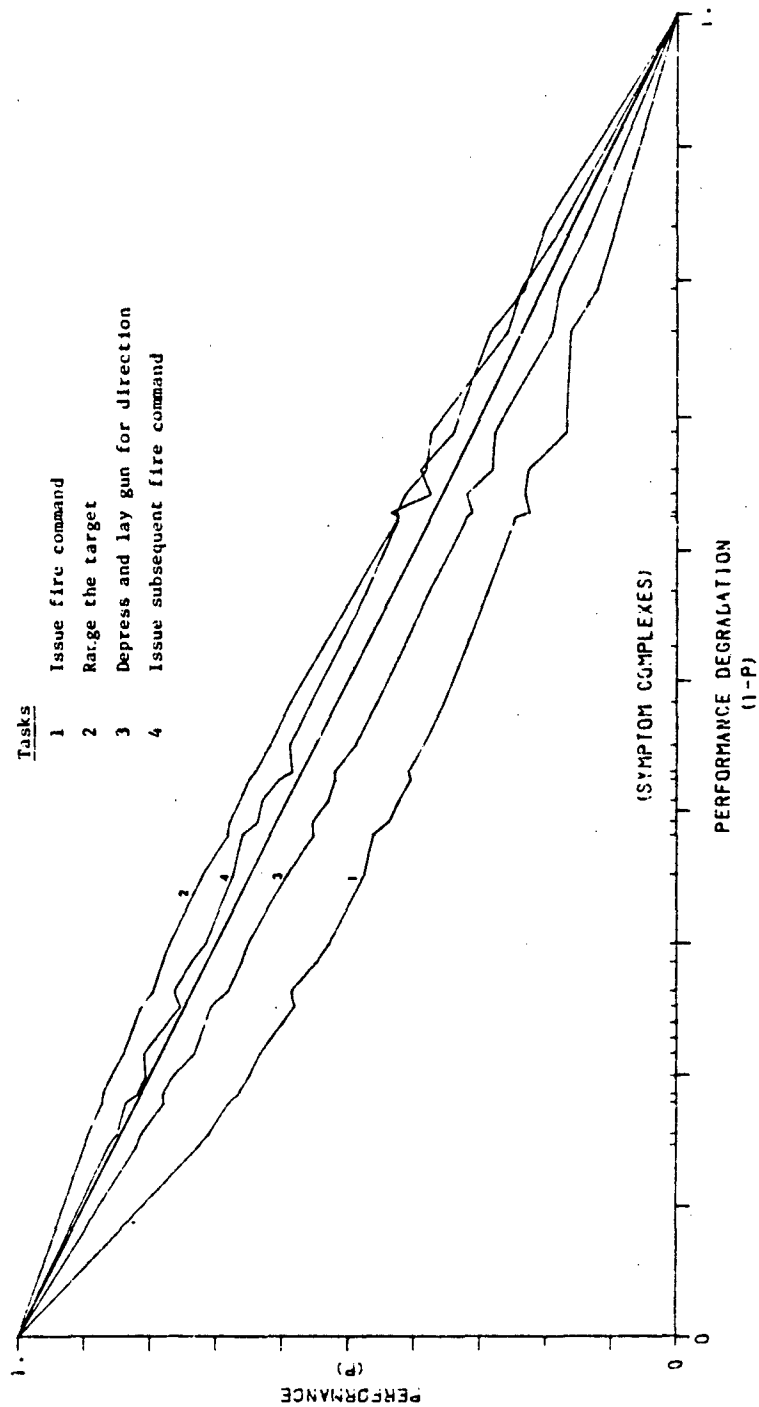


Figure 6.7. Task/position performance: tank crew, tank commander.

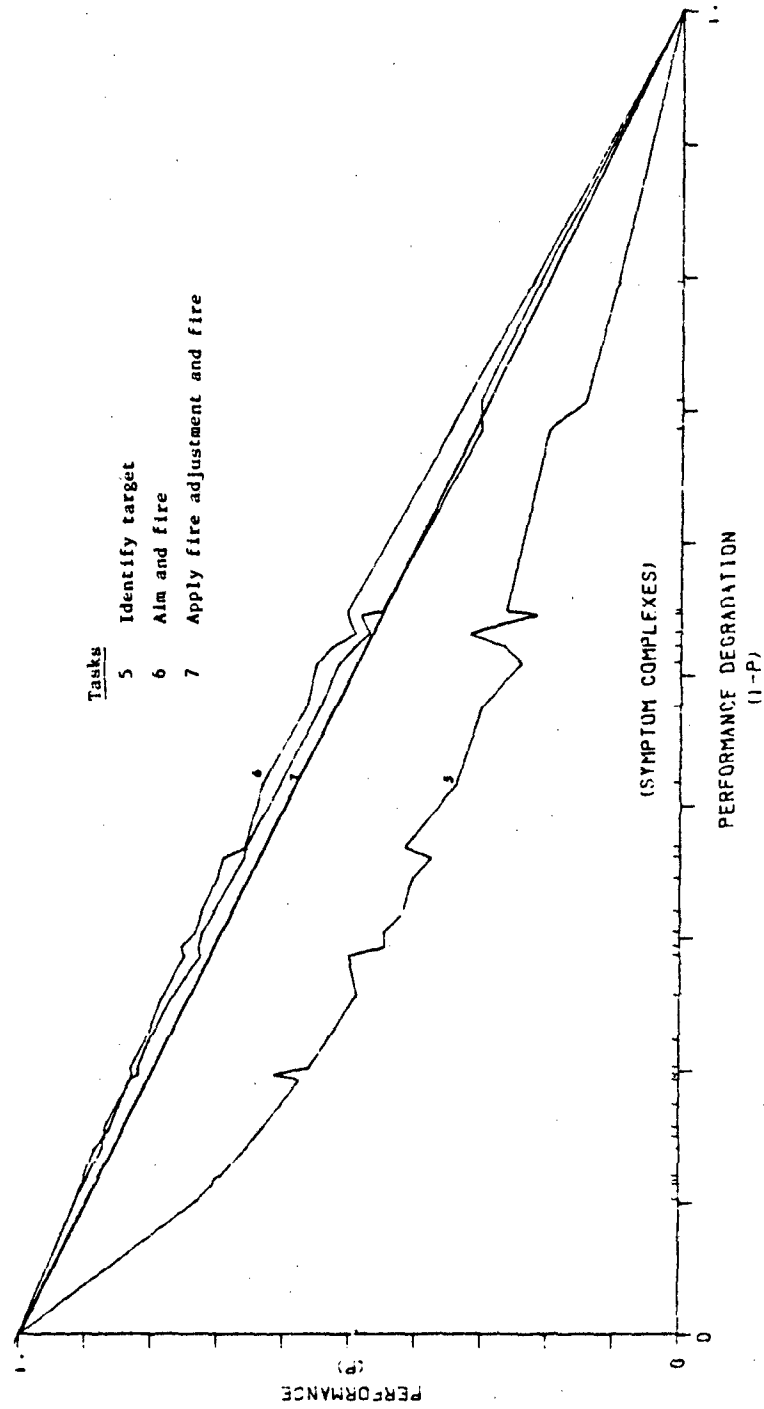


Figure G.8. Task/position performance: tank crew, gunner.

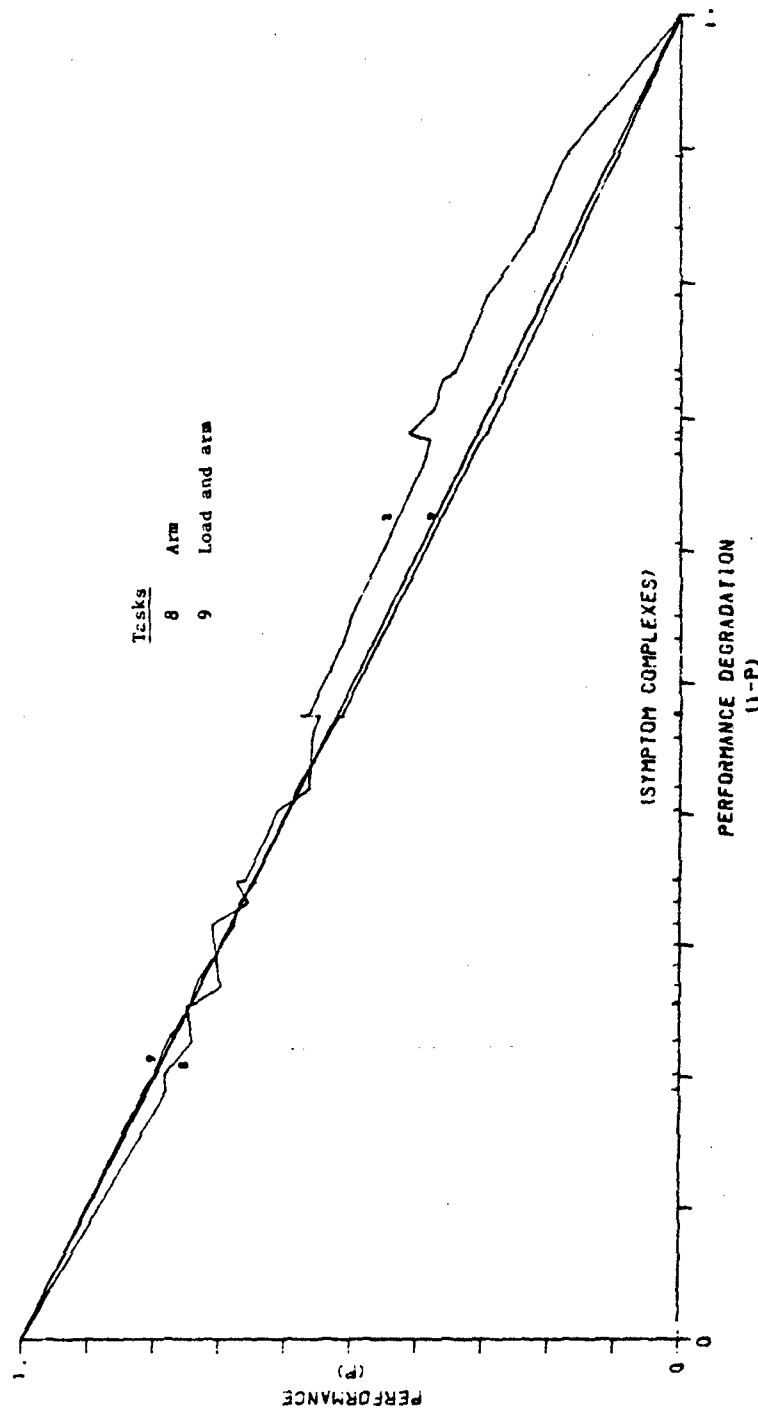


Figure G.9. Task/position performance: tank crew, loader.

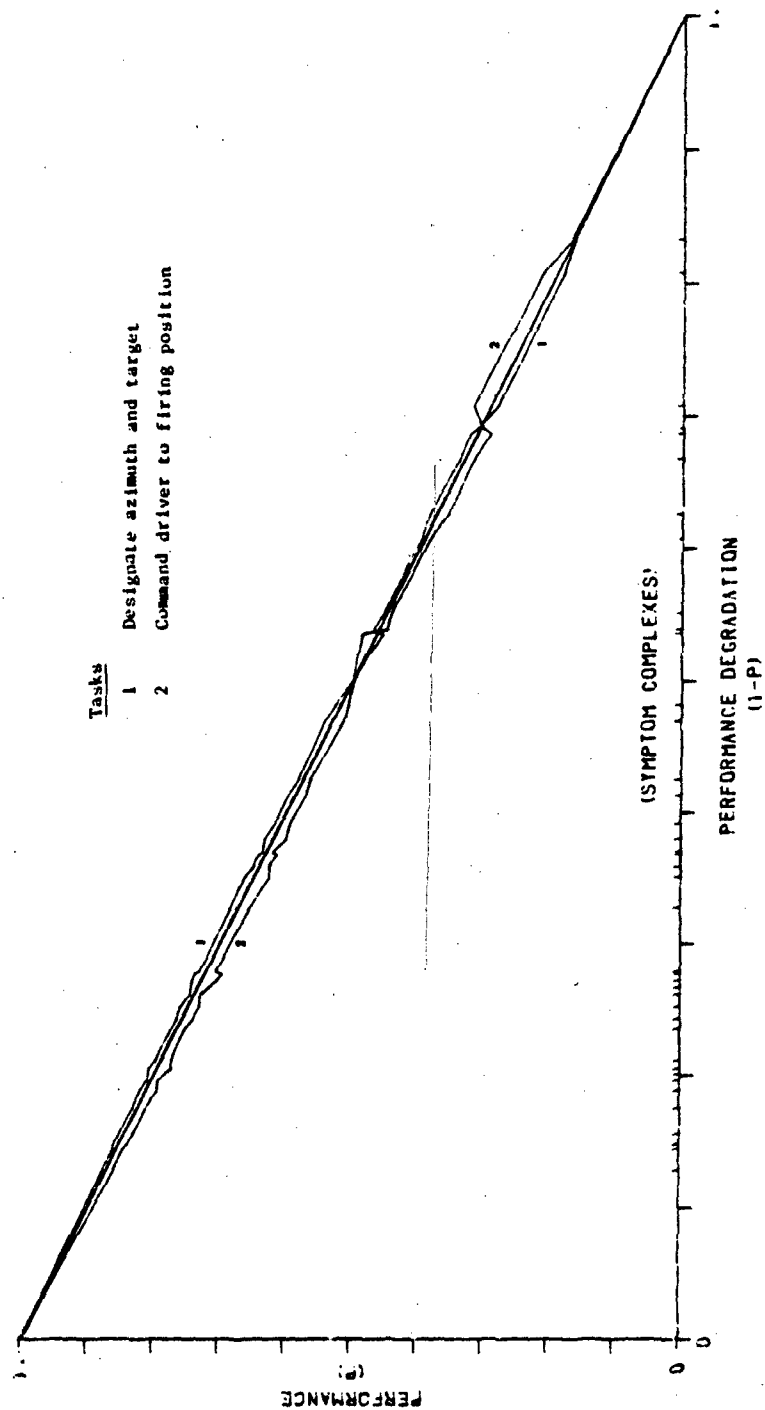


Figure G.10. Task/position performance: TOW crew, squad leader.

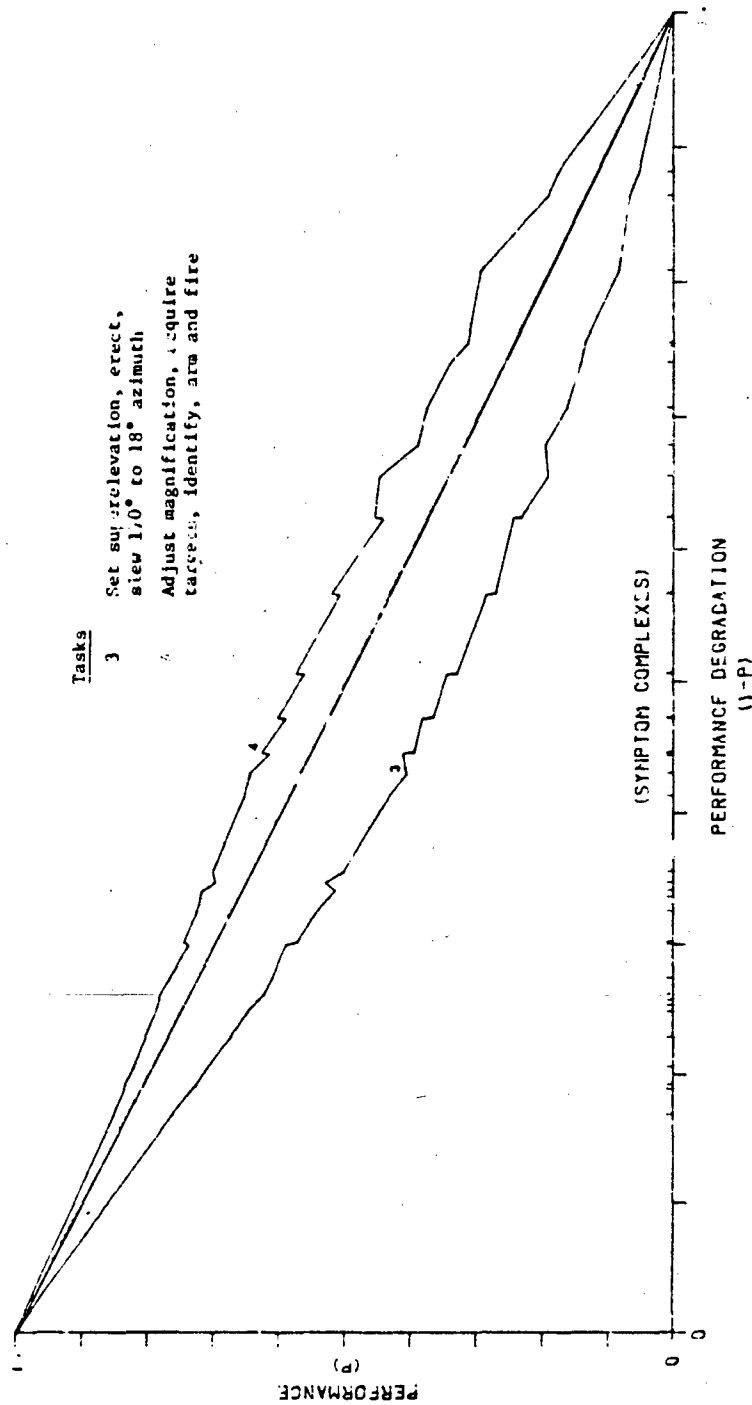


Figure 6.11. Task/position performance: TOW crew, gunner.

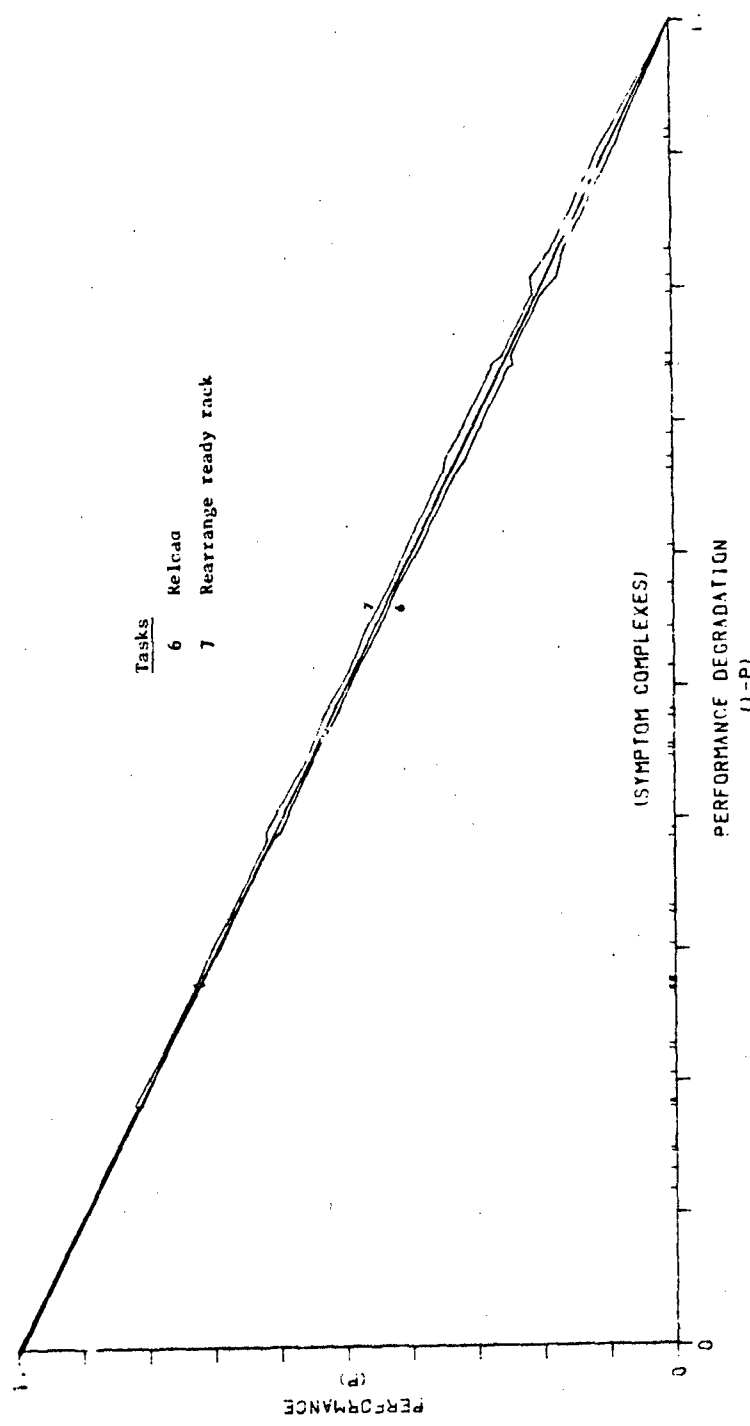


Figure G.12. Task/position performance: TOW crew, loader.

Table G.1. Regression results, gun crew.^a

TASK NUMBER 2				TASK NUMBER 3		
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	3.689165	0.278924	13.226	3.040915	0.209406	14.522
UPPER GASTRO	-0.133953	0.053964	-2.482	-0.154725	0.040514	-3.819
LOWER GASTRO	-0.412253	0.136164	-3.028	-0.335025	0.102228	-3.277
FATIGUE/WEAK	-0.269009	0.067568	-3.981	-0.235993	0.050728	-4.652
HYPOTENSION	-0.088056	0.140524	-0.627	-0.228813	0.105501	-2.169
INFECT/BLEED	-0.267431	0.171796	-1.557	-0.121214	0.128479	-0.940
FLUID LOSS	-0.470530	0.100484	-4.683	-0.419712	0.075440	-5.564
R SQUARED = 0.8629				R SQUARED = 0.9123		
RMS ERROR = 0.367710				RMS ERROR = 0.276066		
DGF = 23				DGF = 23		
TASK NUMBER 4				TASK NUMBER 5		
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	3.871579	0.281584	13.749	2.317021	0.173881	13.325
UPPER GASTRO	-0.120934	0.054478	-2.220	-0.146709	0.033641	-4.361
LOWER GASTRO	-0.437978	0.137462	-3.186	-0.319346	0.084884	-3.762
FATIGUE/WEAK	-0.272550	0.068212	-3.996	-0.248783	0.042121	-5.906
HYPOTENSION	-0.140113	0.141864	-0.988	-0.124967	0.087602	-1.427
INFECT/BLEED	-0.258543	0.173435	-1.491	-0.183087	0.107097	-1.710
FLUID LOSS	-0.497201	0.101442	-4.901	-0.384378	0.062641	-6.216
R SQUARED = 0.8703				R SQUARED = 0.9305		
RMS ERROR = 0.371217				RMS ERROR = 0.229230		
DGF = 23				DGF = 23		
TASK NUMBER 6				TASK NUMBER 7		
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	1.982098	0.229575	8.634	3.060085	0.187107	16.355
UPPER GASTRO	-0.195948	0.044414	-4.412	-0.104743	0.036260	-2.893
LOWER GASTRO	-0.244156	0.112073	-2.179	-0.448053	0.091342	-4.905
FATIGUE/WEAK	-0.325548	0.055613	-5.854	-0.285835	0.045326	-6.306
HYPOTENSION	-0.304213	0.115662	-2.630	-0.238311	0.094267	-2.528
INFECT/BLEED	-0.233430	0.141401	-1.651	-0.119442	0.115245	-1.036
FLUID LOSS	-0.463313	0.082706	-5.602	-0.493278	0.067407	-7.318
R SQUARED = 0.9324				R SQUARED = 0.9405		
RMS ERROR = 0.302653				RMS ERROR = 0.246669		
DGF = 23				DGF = 23		

Table G.1. Regression results, gun crew (Concluded).

TASK NUMBER 8				TASK NUMBER 9			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	2.226995	0.170504	13.061	2.217452	0.195405	11.348	
UPPER GASTRO	-0.135262	0.032988	-4.100	-0.116195	0.037805	-3.074	
LOWER GASTRO	-0.248694	0.083236	-2.988	-0.251282	0.095392	-2.634	
FATIGUE/WEAK	-0.363318	0.041303	-8.796	-0.250744	0.047336	-5.297	
HYPOTENSION	-0.004918	0.045901	-0.057	-0.094368	0.098446	-0.959	
INFECT/BLEED	-0.247344	0.105017	-2.354	-0.273690	0.120354	-2.274	
FLUID LOSS	-0.374360	0.061425	-6.095	-0.384500	0.070395	-5.462	
R SQUARED = 0.9430				R SQUARED = 0.9079			
RMS ERROR = 0.224778				RMS ERROR = 0.257605			
DOF = 23				DOF = 23			
TASK NUMBER 10				TASK NUMBER 11			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	2.753800	0.235600	11.688	2.584123	0.166072	15.560	
UPPER GASTRO	-0.096342	0.045582	-2.114	-0.126504	0.032170	-3.937	
LOWER GASTRO	-0.323004	0.115018	-2.808	-0.369957	0.081072	-4.563	
FATIGUE/WEAK	-0.304344	0.057073	-5.333	-0.215333	0.040230	-5.353	
HYPOTENSION	-0.034336	0.118697	-0.289	-0.126132	0.083668	-1.508	
INFECT/BLEED	-0.290475	0.145112	-2.002	-0.250991	0.102287	-2.454	
FLUID LOSS	-0.381880	0.084876	-4.499	-0.354653	0.059828	-5.928	
R SQUARED = 0.8822				R SQUARED = 0.9287			
RMS ERROR = 0.310595				RMS ERROR = 0.218935			
DOF = 23				DOF = 23			

^aTask number 1 regression parameters are those given for the chief of section in Sec. 3.

Table G.2. Regression results, FDC crew.

TASK NUMBER 1				TASK NUMBER 2			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	3.068488	0.359570	8.534	3.407176	0.335379	10.159	
UPPER GASTRO	-0.269195	0.069566	-3.870	-0.194729	0.064886	-3.001	
LOWER GASTRO	-0.468424	0.175533	-2.649	-0.550326	0.163724	-3.361	
FATIGUE/WEAK	-0.063502	0.087104	-0.729	-0.082766	0.081243	-1.019	
HYPOTENSION	-0.195820	0.181154	-1.081	-0.225097	0.168966	-1.332	
INFECT/BLEED	-0.243058	0.221468	-1.278	-0.148599	0.206568	-0.719	
FLUID LOSS	-0.457986	0.129537	-3.536	-0.461945	0.120822	-3.823	
R SQUARED = 0.7774				R SQUARED = 0.7774			
RMS ERROR = 0.470027				RMS ERROR = 0.442136			
UGF = 23				UGF = 23			
TASK NUMBER 3				TASK NUMBER 4			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	3.918948	0.400721	9.780	2.537191	0.173542	14.620	
UPPER GASTRO	-0.256229	0.077528	-3.305	-0.188812	0.033575	-5.623	
LOWER GASTRO	-0.552430	0.195622	-2.824	-0.338537	0.084719	-3.996	
FATIGUE/WEAK	-0.041489	0.097072	-0.427	-0.124433	0.082040	-2.960	
HYPOTENSION	0.013608	0.201887	0.067	-0.135473	0.087432	-1.549	
INFECT/BLEED	-0.396276	0.246814	-1.606	-0.099580	0.108809	-0.932	
FLUID LOSS	-0.587077	0.144362	-4.067	-0.312262	0.062520	-4.995	
R SQUARED = 0.7303				R SQUARED = 0.8976			
RMS ERROR = 0.528278				RMS ERROR = 0.228784			
UGF = 23				UGF = 23			
TASK NUMBER 5				TASK NUMBER 6			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	2.378963	0.182964	13.002	2.439342	0.262973	9.276	
UPPER GASTRO	-0.175230	0.035398	-4.950	-0.204814	0.050878	-4.026	
LOWER GASTRO	-0.301139	0.089319	-3.371	-0.380811	0.128377	-2.966	
FATIGUE/WEAK	-0.081759	0.044322	-1.845	-0.082486	0.063704	-1.295	
HYPOTENSION	-0.043004	0.092179	-0.467	-0.179482	0.132488	-1.355	
INFECT/BLEED	-0.131882	0.112692	-1.170	-0.081187	0.161971	-0.501	
FLUID LOSS	-0.311628	0.065914	-4.728	-0.337566	0.094737	-3.563	
R SQUARED = 0.8476				R SQUARED = 0.7986			
RMS ERROR = 0.241205				RMS ERROR = 0.346681			
UGF = 23				UGF = 23			

Table G.2: Regression results, FDC crew (Concluded).

TASK NUMBER 7				TASK NUMBER 8		
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	2.952502	0.184171	16.031	2.558462	0.223189	11.463
UPPER GASTRO	-0.142595	0.035632	-4.002	-0.217167	0.043181	-5.029
LOWER GASTRO	-0.426095	0.089908	-4.739	-0.416009	0.108955	-3.818
FATIGUE/WEAK	-0.043908	0.044614	-1.881	-0.044161	0.054066	-0.817
HYPOTENSION	-0.248592	0.092787	-2.679	-0.124583	0.112444	-1.108
INFECT/BLEED	-0.007846	0.113436	-0.069	-0.175913	0.137467	-1.280
FLUID LOSS	-0.326918	0.066349	-4.927	-0.421898	0.080405	-5.247
R SQUARED = 0.8776				R SQUARED = 0.8543		
RMS ERROR = 0.242706				RMS ERROR = 0.294233		
DGF = 23				DGF = 23		

Table G.3. Regression results, tank crew.^a

TASK NUMBER 1				TASK NUMBER 2			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	2.824024	0.271434	10.404	4.352746	0.313823	13.870	
UPPER GASTRO	-0.286400	0.052515	-5.454	-0.327168	0.040714	-5.389	
LOWER GASTRO	-0.412689	0.132507	-3.114	-0.571208	0.153201	-3.728	
FATIGUE/WEAK	-0.213909	0.065753	-3.253	-0.265402	0.076022	-3.491	
HYPOTENSION	-0.214144	0.136751	-1.566	-0.192390	0.158106	-1.217	
INFECT/BLEED	-0.068180	0.167183	-0.408	-0.012041	0.193291	-0.062	
FLUID LOSS	-0.439119	0.097785	-4.491	-0.525015	0.113054	-4.644	
R SQUARED = 0.8871				R SQUARED = 0.8879			
RMS ERROR = 0.357836				RMS ERROR = 0.413718			
DGF = 23				DGF = 21			
TASK NUMBER 3				TASK NUMBER 4			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	3.461919	0.231725	14.940	3.762089	0.237709	15.826	
UPPER GASTRO	-0.297045	0.044832	-6.626	-0.305305	0.045990	-6.639	
LOWER GASTRO	-0.504297	0.113122	-4.458	-0.473994	0.116044	-4.085	
FATIGUE/WEAK	-0.255146	0.056134	-4.545	-0.197353	0.057584	-3.427	
HYPOTENSION	-0.179685	0.116745	-1.539	-0.143962	0.119760	-1.202	
INFECT/BLEED	0.009123	0.142725	0.064	-0.128056	0.146411	-0.875	
FLUID LOSS	-0.448394	0.083480	-5.491	-0.474361	0.085636	-5.539	
R SQUARED = 0.9233				R SQUARED = 0.9128			
RMS ERROR = 0.305487				RMS ERROR = 0.313376			
DGF = 23				DGF = 23			
TASK NUMBER 5				TASK NUMBER 6			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	2.610335	0.227222	11.488	4.419381	0.242622	18.215	
UPPER GASTRO	-0.286496	0.043961	-6.517	-0.309931	0.046940	-6.603	
LOWER GASTRO	-0.352076	0.110924	-3.174	-0.633198	0.118442	-5.346	
FATIGUE/WEAK	-0.172275	0.055043	-3.130	-0.159524	0.058774	-2.714	
HYPOTENSION	-0.237827	0.114476	-2.078	-0.222908	0.122235	-1.824	
INFECT/BLEED	0.059603	0.139951	0.426	0.017539	0.149437	0.117	
FLUID LOSS	-0.456446	0.081858	-5.576	-0.579837	0.087406	-6.634	
R SQUARED = 0.9084				R SQUARED = 0.9192			
RMS ERROR = 0.299550				RMS ERROR = 0.319853			
DGF = 23				DGF = 23			

Table G.3. Regression results, tank crew (Concluded).

TASK NUMBER 7			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	4.140210	0.303280	13.783
UPPER GASTRO	-0.248242	0.058148	-4.269
LOWER GASTRO	-0.260567	0.149415	-1.744
FATIGUE/WEAK	-0.517479	0.070561	-7.334
HYPOTENSION	0.079068	0.144651	0.547
INFECT/BLEED	-0.371420	0.122143	-3.041
FLUID LOSS	-0.507669	0.107218	-5.574
R SQUARED = 0.8933			
RMS ERROR = 0.427812			
DGF = 33			

TASK NUMBER 8				TASK NUMBER 9		
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T
INTERCEPT	2.883474	0.194320	14.839	3.441871	0.219059	15.712
UPPER GASTRO	-0.212662	0.037595	-5.657	-0.226492	0.042382	-5.349
LOWER GASTRO	-0.367667	0.094862	-3.876	-0.462622	0.106939	-4.326
FATIGUE/WEAK	-0.192157	0.047073	-4.082	-0.322628	0.053066	-6.080
HYPOTENSION	-0.100430	0.097900	-1.026	-0.190425	0.110364	-1.725
INFECT/BLEED	-0.060938	0.119687	-0.509	0.000835	0.134924	0.006
FLUID LOSS	-0.468161	0.070005	-6.688	-0.528678	0.079917	-6.699
R SQUARED = 0.9166				R SQUARED = 0.9362		
RMS ERROR = 0.256176				RMS ERROR = 0.288790		
DGF = 23				DGF = 23		

^aTask number 10 regression parameters are those given for the driver in Sec. 3.

Table G.4. Regression results, TOW crew.^a

TASK NUMBER 1				TASK NUMBER 2			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	3.944742	0.280672	14.053	3.704884	0.294205	13.036	
UPPER GASTRO	-0.225626	0.053813	-4.193	-0.233399	0.054491	-4.283	
LOWER GASTRO	-0.263445	0.138276	-1.905	-0.288117	0.140017	-2.058	
FATIGUE/WEAK	-0.374660	0.065301	-5.737	-0.354899	0.066123	-5.367	
HYPOTENSION	0.012139	0.133848	0.091	0.124455	0.135553	0.918	
INFECT/BLEED	-0.384484	0.113037	-3.401	-0.413633	0.114460	-3.614	
FLUID LOSS	-0.516037	0.099225	-5.201	-0.493189	0.100474	-4.909	
R SQUARED = 0.8683				R SQUARED = 0.8212			
RMS ERROR = 0.395920				RMS ERROR = 0.400905			
DGF = 33				DGF = 33			
TASK NUMBER 3				TASK NUMBER 4			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	3.339075	0.301455	11.077	3.565372	0.267341	13.334	
UPPER GASTRO	-0.279193	0.057798	-4.830	-0.216770	0.051254	-4.229	
LOWER GASTRO	-0.207870	0.148516	-1.400	-0.253533	0.131709	-1.925	
FATIGUE/WEAK	-0.438429	0.070137	-6.251	-0.335201	0.062200	-5.369	
HYPOTENSION	-0.003445	0.143740	-0.027	0.022488	0.127510	0.180	
INFECT/BLEED	-0.473434	0.121406	-3.900	-0.344564	0.107668	-3.200	
FLUID LOSS	-0.488139	0.106573	-4.580	-0.481393	0.094512	-5.093	
R SQUARED = 0.8775				R SQUARED = 0.8593			
RMS ERROR = 0.425238				RMS ERROR = 0.377116			
DGF = 33				DGF = 33			
TASK NUMBER 6				TASK NUMBER 7			
SYMPTOM	BETA PARAMETER	STANDARD ERROR	STUDENT T	BETA PARAMETER	STANDARD ERROR	STUDENT T	
INTERCEPT	4.335487	0.287865	15.061	4.464894	0.276733	16.133	
UPPER GASTRO	-0.254126	0.055193	-4.604	-0.319320	0.053540	-5.964	
LOWER GASTRO	-0.272422	0.141820	-1.921	-0.641741	0.135094	-4.750	
FATIGUE/WEAK	-0.527975	0.066975	-7.783	-0.210481	0.067037	-3.140	
HYPOTENSION	0.038926	0.137298	0.279	-0.192817	0.139420	-1.383	
INFECT/BLEED	-0.408598	0.115934	-3.527	0.032442	0.170447	0.190	
FLUID LOSS	-0.643662	0.101768	-6.325	-0.597558	0.099695	-5.993	
R SQUARED = 0.9111				R SQUARED = 0.9039			
RMS ERROR = 0.406067				RMS ERROR = 0.364822			
DGF = 33				DGF = 23			

^aTask number 5 regression parameters are those given for the driver in Sec. 3.

Appendix H

EARLY LOWER GASTROINTESTINAL DISTRESS EFFECT ON PERFORMANCE

This appendix shows the effect of early lower gastrointestinal distress (LG) on performance. As discussed in Sec. 4, that effect is due to one or two brief episodes of diarrhea that may occur in a minority of individuals--about 10 percent with a maximum of 30 percent at high doses of the intermediate dose range.

Figures H.1 and H.2 give the symptom complexes, including the early LG effect. Figures H.3 through H.6 are three-dimensional plots for the gun crew loader, FDC computer, tank commander, and TOW loader, chosen to illustrate the early LG effect on performance. Beginning with doses from around 300 to 450 rads (cGy) and for times between about 2 to 6 hr, the initial surface depression is largely attributable to early LG effects.

Figures H.7 through H.10 show the early LG effect on performance given in the contour plots of the same four crewmembers. This is indicated by the dipping in the performance contours at the doses and times indicated above.

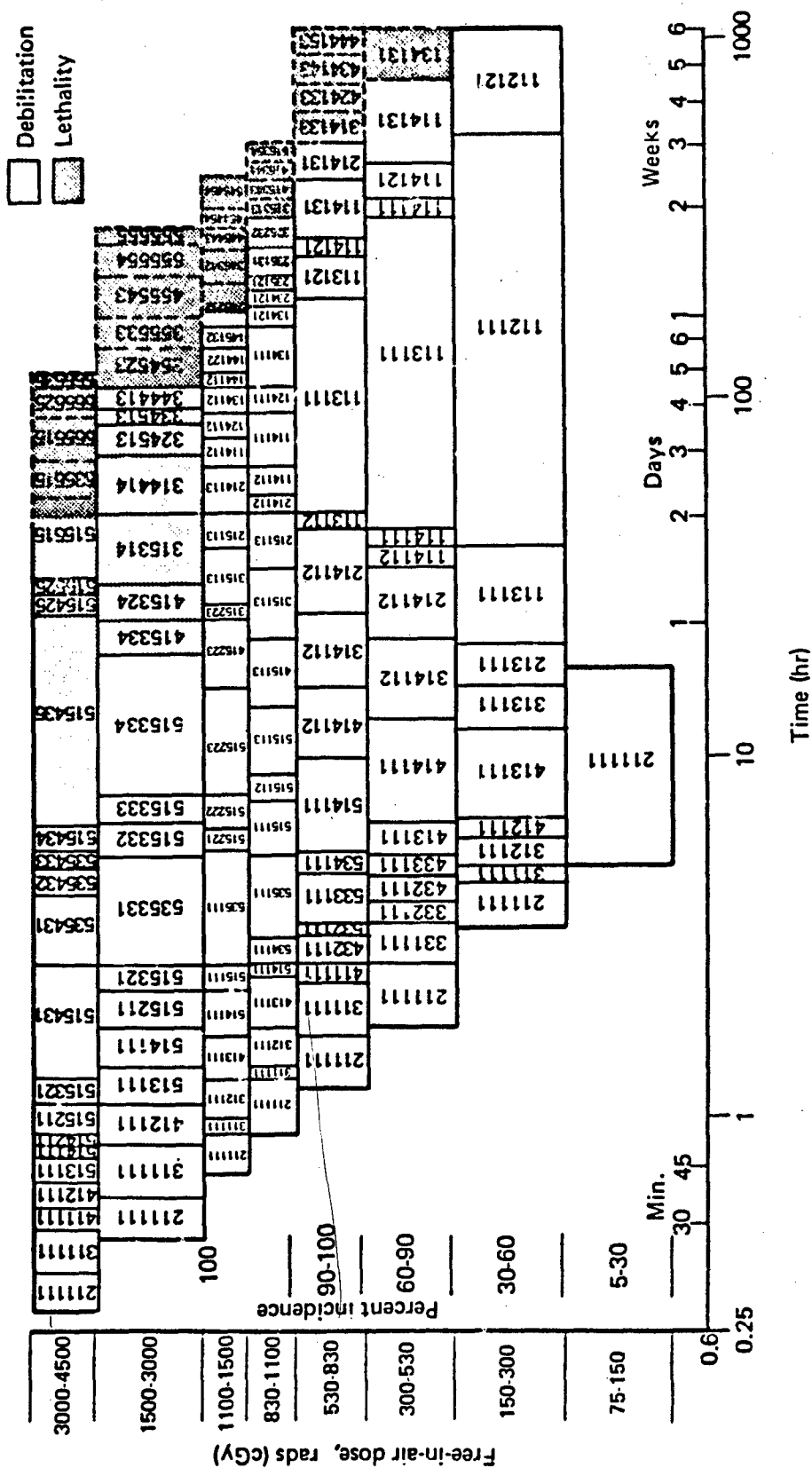


Figure H.1. Symptom complexes--with early LG.

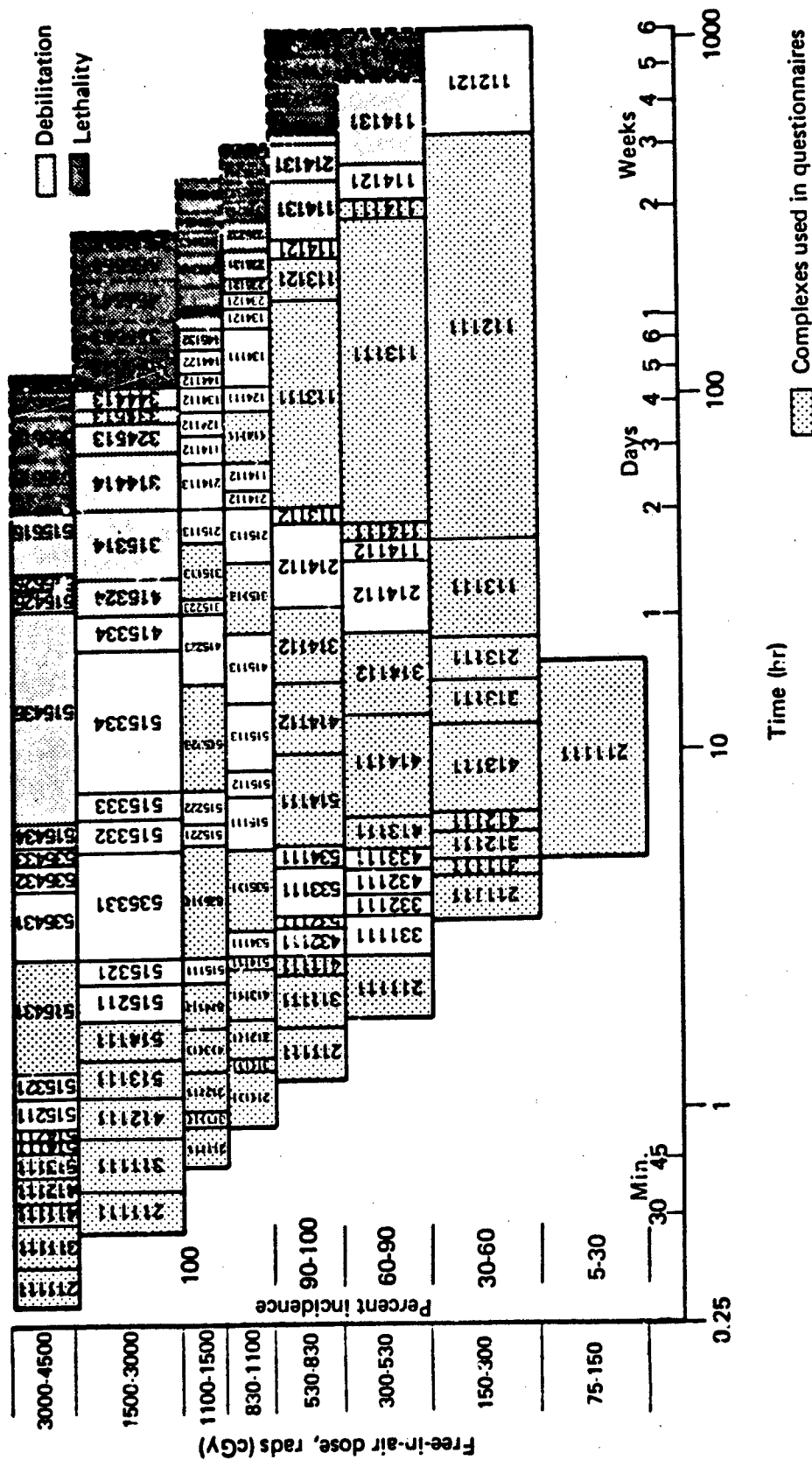


Figure H.2. Symptom complexes including those from questionnaires--with early LG.

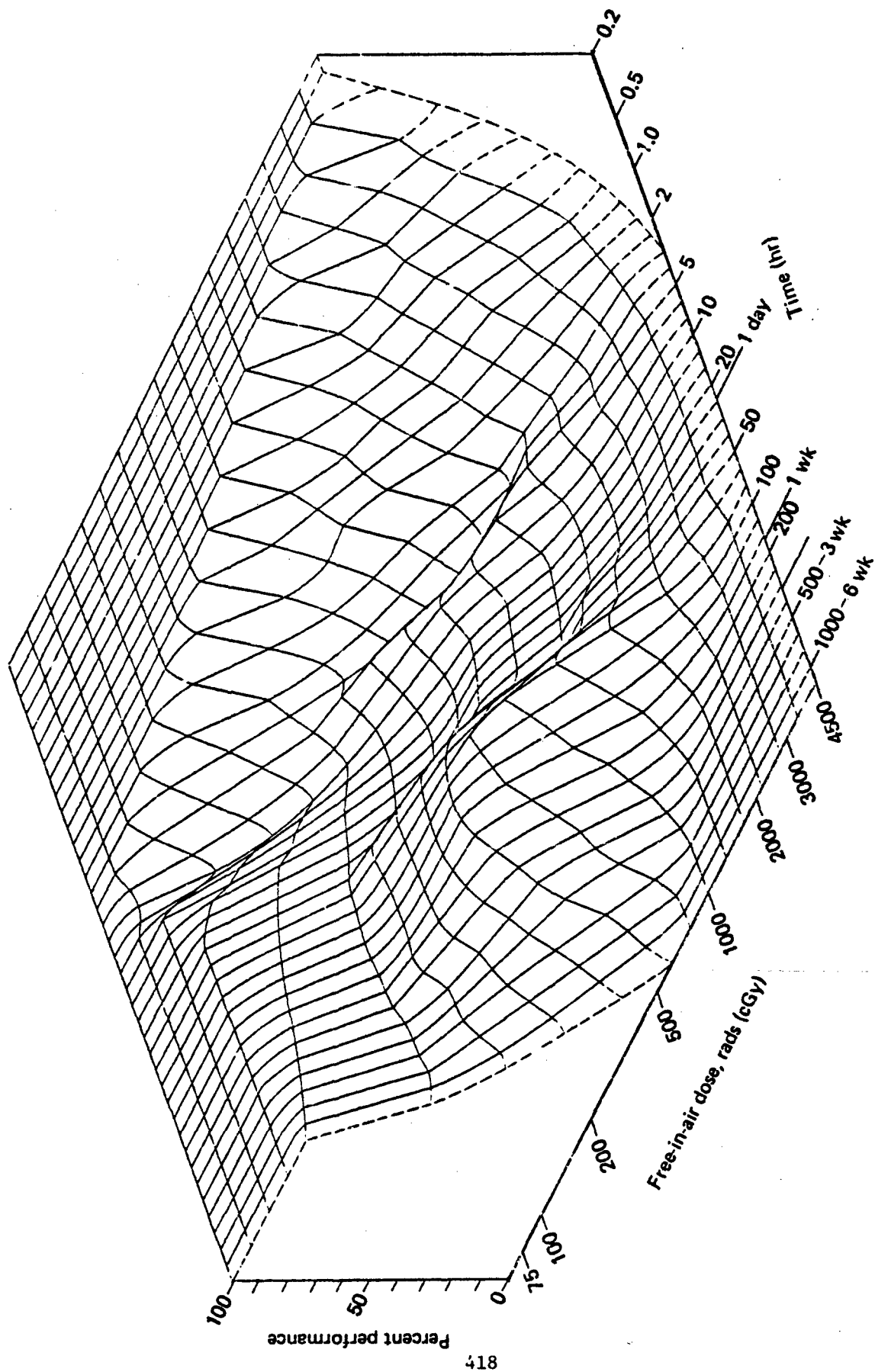


Figure H.3. Performance surface: gun crew, loader.

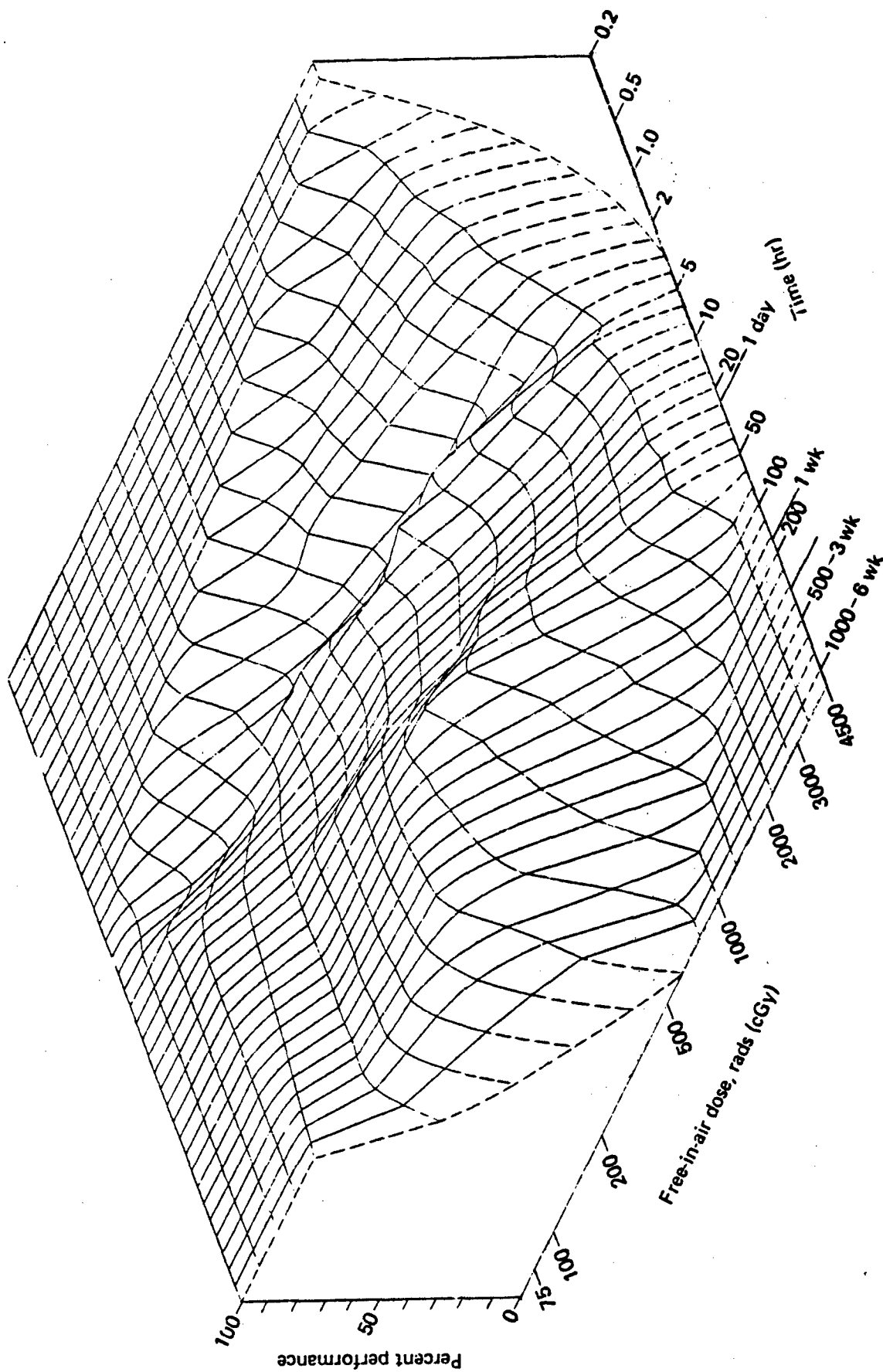


Figure H.4. Performance surface: FDC crew, computer.

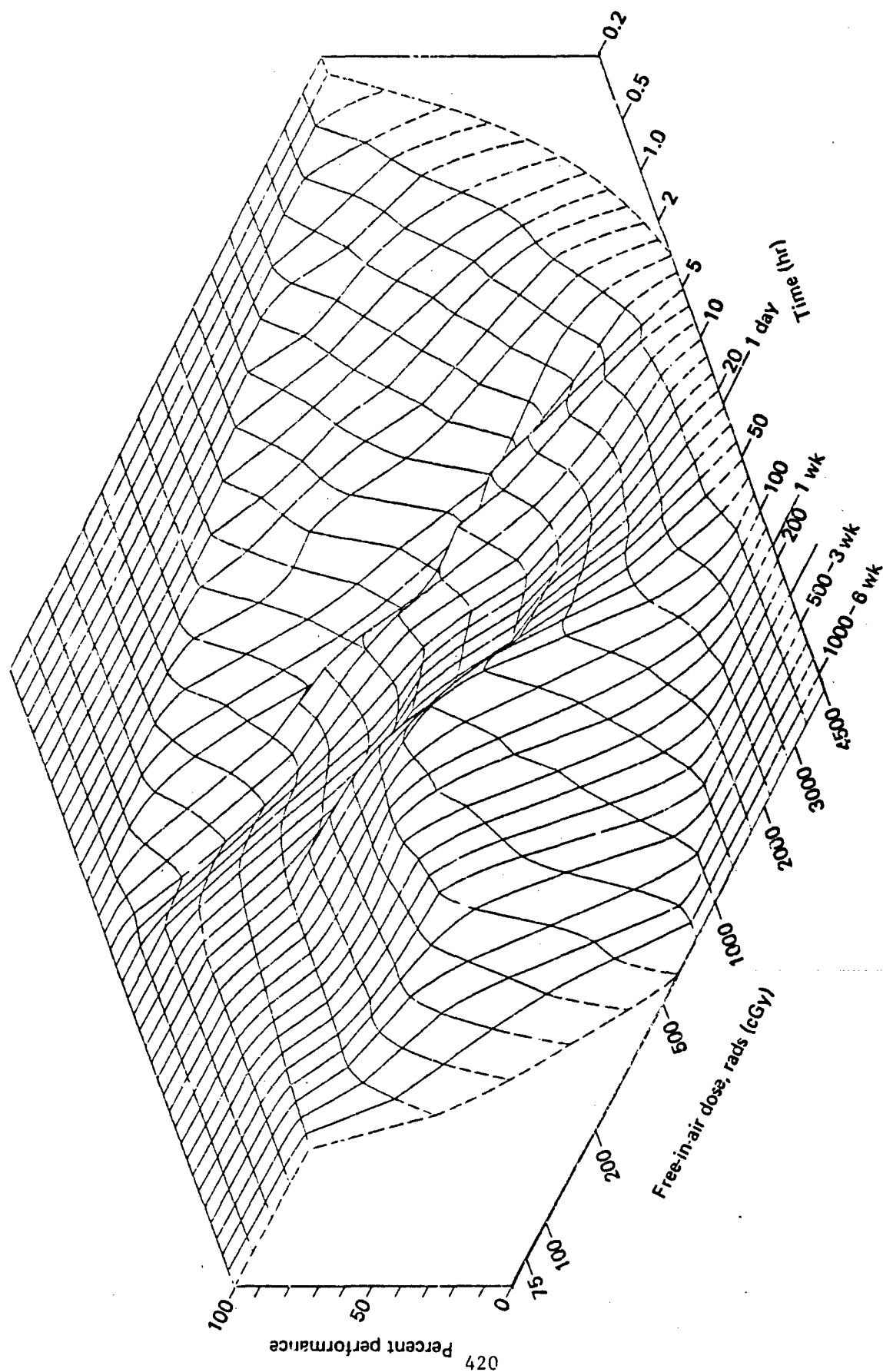


Figure H.5. Performance surface: tank crew, tank commander.

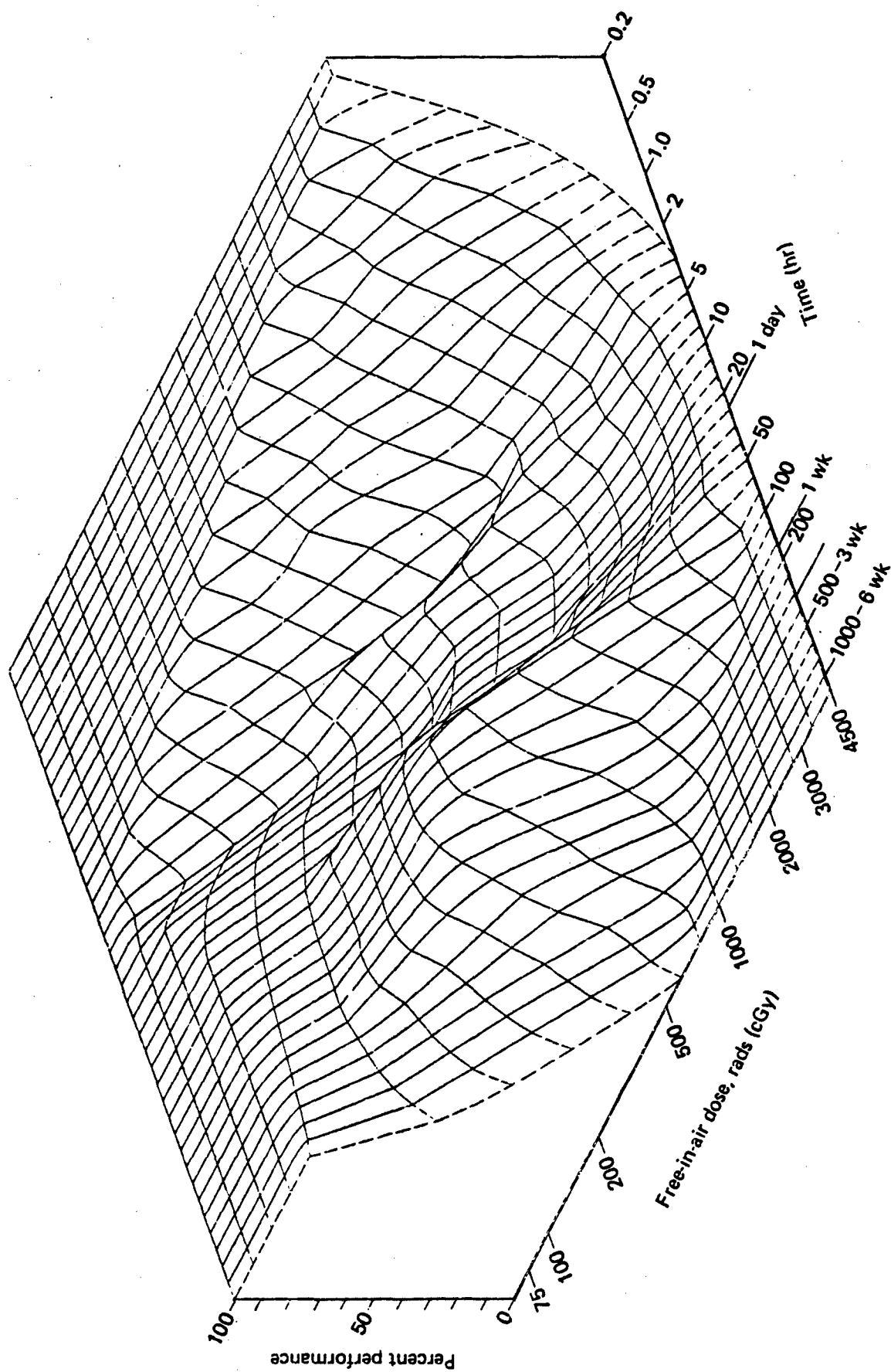


Figure H.6. Performance surface: TOW crew, gunner.

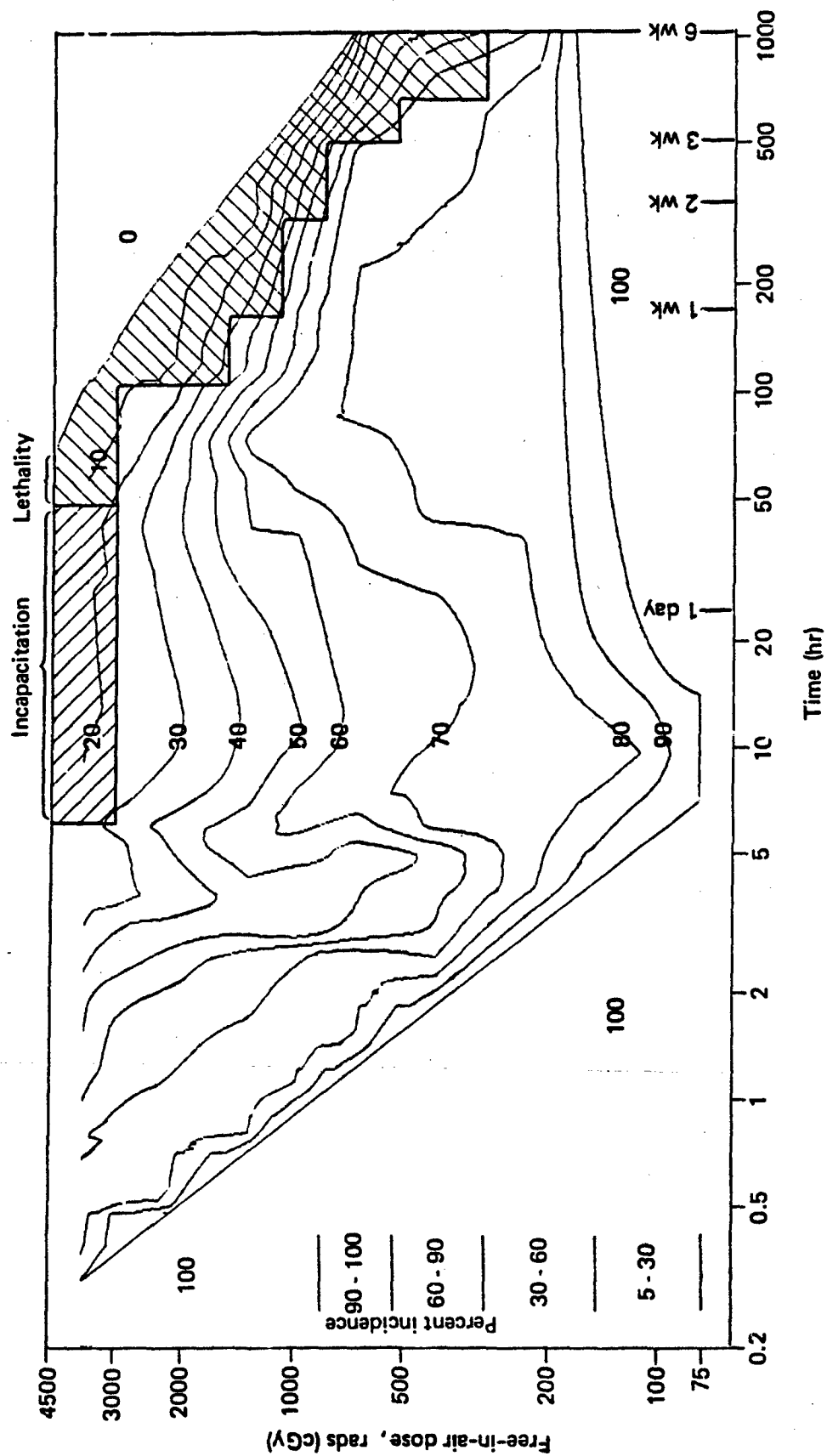


Figure H.8. Performance contours: 10 percent performance intervals, FDC crew, computer.

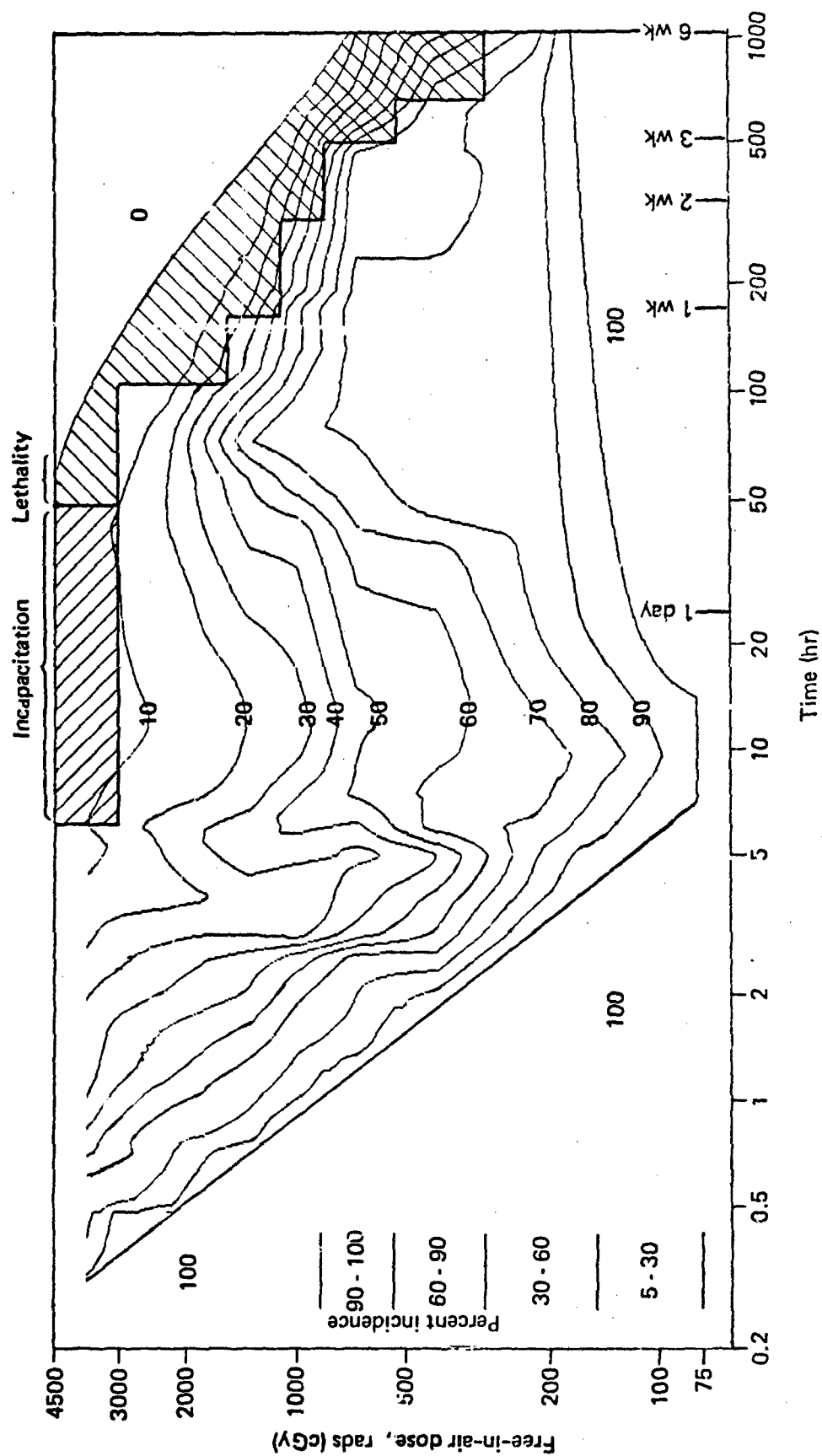


Figure H.9. Performance contours: 10 percent performance intervals, tank crew, tank commander.

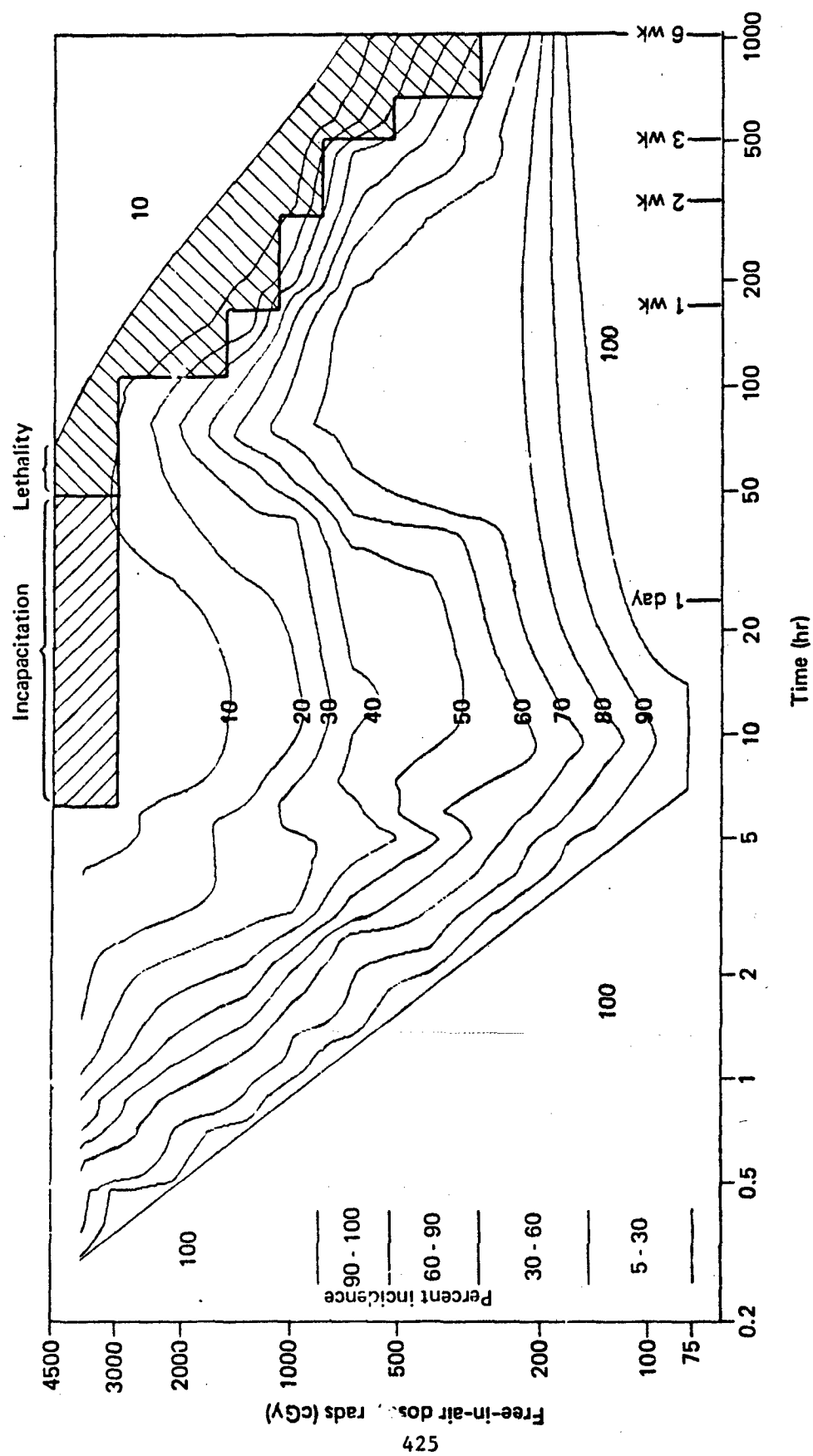


Figure H.10. Performance contours: 10 percent performance intervals, TOW crew, gunner.

Appendix I

DOSE, TIME, AND CREWMEMBER PERFORMANCE INPUT VALUES FOR MAPPING

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Table I.1. Initial performance data, gun crew.

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE	TIME	CHIEF OF SECTION	GUNNER	ASSISTANT GUNNER	LOADER
75- 150	211111	5.0 18.0	9.49	0.7226	0.8320	0.8083	0.6814
150- 300	211111	3.4 4.5	3.91	0.7226	0.8320	0.8083	0.6814
	311111	4.5 5.0	4.74	0.6751	0.8106	0.7865	0.6487
	312111	5.0 6.0	5.48	0.6341	0.7701	0.7403	0.5777
	412111	6.0 6.8	6.39	0.5804	0.7432	0.7135	0.5415
	413111	6.8 12.0	9.03	0.5357	0.6937	0.6583	0.4667
	313111	12.0 16.0	13.86	0.5912	0.7239	0.6880	0.5033
	213111	16.0 21.0	18.33	0.6444	0.7522	0.7162	0.5349
	113111	21.0 40.0	28.98	0.6943	0.7784	0.7428	0.5761
	112111	40.0 540.0	146.97	0.7314	0.8178	0.7888	0.6472
	112121	540.0 1060.0	756.57	0.6568	0.7834	0.7506	0.5916
300- 530	211111	1.8 2.7	2.20	0.7226	0.8320	0.8083	0.6814
	311111	2.7 3.5	3.07	0.6751	0.8106	0.7865	0.6487
	312111	3.5 3.9	3.69	0.6341	0.7701	0.7403	0.5777
	412111	3.9 4.6	4.24	0.5804	0.7432	0.7135	0.5415
	413111	4.6 6.6	5.51	0.5357	0.6937	0.6583	0.4667
	414111	6.6 13.0	9.26	0.4904	0.6394	0.5945	0.3932
	314112	13.0 22.0	16.91	0.4386	0.5694	0.5247	0.3259
	214112	22.0 35.0	27.75	0.4947	0.6048	0.5582	0.3589
	114112	35.0 40.0	37.42	0.5510	0.6392	0.5912	0.3933
	114111	40.0 45.0	42.43	0.6545	0.7333	0.6909	0.5016
	113111	45.0 320.0	120.00	0.6043	0.7784	0.7428	0.5761
	114111	320.0 360.0	339.41	0.6545	0.7333	0.6909	0.5016
	114121	360.0 450.0	402.49	0.5712	0.6967	0.6430	0.4429
	114131	450.0 780.0	592.45	0.4836	0.6574	0.5921	0.3857
	134131	780.0 1080.0	917.82	0.3108	0.4821	0.4108	0.2568
530- 830	211111	1.2 1.7	1.43	0.7226	0.8320	0.8083	0.6814
	311111	1.7 2.4	2.02	0.6751	0.8106	0.7865	0.6487
	411111	2.4 2.7	2.55	0.6238	0.7871	0.7630	0.6146
	412111	2.7 3.3	2.96	0.5804	0.7432	0.7135	0.5415
	512111	3.3 3.5	3.37	0.5246	0.7143	0.6852	0.5050
	513111	3.5 4.8	4.10	0.4793	0.6618	0.6274	0.4304
	514111	4.8 10.0	6.93	0.4343	0.6050	0.5657	0.3568
	414112	10.0 16.0	12.65	0.3840	0.5332	0.4910	0.2445
	314112	16.0 26.0	20.40	0.4386	0.5694	0.5247	0.3259
	214112	26.0 45.0	34.21	0.4947	0.6048	0.5582	0.3589
	113112	45.0 50.0	47.43	0.5953	0.6936	0.6515	0.4667
	113111	50.0 190.0	97.47	0.6943	0.7784	0.7428	0.5761
	113121	190.0 250.0	217.95	0.6149	0.7458	0.6995	0.5176
	114121	250.0 280.0	264.58	0.5712	0.6967	0.6430	0.4429
	114131	280.0 410.0	338.82	0.4836	0.6574	0.5921	0.3857
	214131	410.0 520.0	461.74	0.4276	0.6237	0.5591	0.3516
	314133	520.0 630.0	572.36	0.2000	0.3728	0.3169	0.1626
	424133	630.0 760.0	691.95	0.1216	0.2634	0.2193	0.1112
	434143	760.0 910.0	831.62	0.0633	0.1722	0.1356	0.0686
	444153	910.0 1080.0	991.36	0.0314	0.1079	0.0805	0.0416

Table I.1. Initial performance data, gun crew (Continued).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TIME	CHIEF OF SECTION	GUNNER	ASSISTANT GUNNER	LOADER
830- 1100	211111	0.9	1.3	1.08	0.7226	0.8320	0.8083	0.6814
	311111	1.3	1.4	1.35	0.6751	0.8106	0.7865	0.6487
	312111	1.4	1.8	1.59	0.6341	0.7701	0.7403	0.5777
	413111	1.8	2.5	2.12	0.5357	0.6937	0.6583	0.4667
	514111	2.5	3.2	2.83	0.4343	0.6050	0.5657	0.3588
	515111	3.2	7.6	4.93	0.3904	0.5452	0.5019	0.2931
	515112	7.6	9.0	8.27	0.2932	0.4358	0.3946	0.2108
	515113	9.0	14.0	11.22	0.2118	0.3322	0.2967	0.1468
	415113	14.0	22.0	17.55	0.2519	0.3655	0.3256	0.1601
	315113	22.0	35.0	27.75	0.2968	0.4000	0.3559	0.1874
	215113	35.0	50.0	41.83	0.3460	0.4356	0.3874	0.2108
	214112	50.0	56.0	52.91	0.4947	0.6048	0.5582	0.4509
	114112	56.0	67.0	61.25	0.5510	0.6392	0.5912	0.3933
	114111	67.0	92.0	78.51	0.6545	0.7333	0.6909	0.5016
	124111	92.0	110.0	100.60	0.5680	0.6570	0.6076	0.4288
	134111	110.0	160.0	132.66	0.4771	0.5716	0.5177	0.3589
	134121	160.0	180.0	164.71	0.3905	0.5270	0.4638	0.3065
	234121	180.0	190.0	184.93	0.3386	0.4905	0.4304	0.2703
	235121	190.0	200.0	194.94	0.2992	0.4297	0.3689	0.2204
	235131	200.0	260.0	228.04	0.2304	0.3863	0.3203	0.1826
	325232	260.0	320.0	288.44	0.1730	0.2972	0.2523	0.1205
	315343	320.0	360.0	334.41	0.1138	0.2155	0.1823	0.0714
	415343	360.0	410.0	384.19	0.0930	0.1918	0.1630	0.0622
	415344	410.0	460.0	434.28	0.0622	0.1326	0.1119	0.0410
	515354	460.0	520.0	489.08	0.0359	0.0994	0.0815	0.0283
1100- 1500	211111	0.7	0.9	0.79	0.7226	0.8320	0.8083	0.6814
	311111	0.9	1.0	0.95	0.6751	0.8106	0.7865	0.6487
	312111	1.0	1.3	1.14	0.6341	0.7701	0.7403	0.5777
	413111	1.3	1.7	1.49	0.5357	0.6937	0.6583	0.4667
	514111	1.7	2.3	1.98	0.4343	0.6050	0.5657	0.3588
	515111	2.3	5.3	3.49	0.3904	0.5452	0.5019	0.2931
	515221	5.3	5.7	5.50	0.2965	0.4572	0.4162	0.2121
	515222	5.7	8.0	6.75	0.2144	0.3517	0.3157	0.1478
	515223	8.0	16.0	11.31	0.1502	0.2590	0.2299	0.1005
	415223	16.0	25.0	20.00	0.1814	0.2860	0.2546	0.1145
	315223	25.0	27.0	25.98	0.2174	0.3189	0.2811	0.1303
	315113	27.0	40.0	32.66	0.2968	0.4000	0.3559	0.1874
	215113	40.0	50.0	44.72	0.3460	0.4356	0.3874	0.2108
	214113	50.0	66.0	57.45	0.3881	0.4965	0.4498	0.2650
	114112	66.0	80.0	72.66	0.5510	0.6392	0.5912	0.3933
	124112	80.0	92.0	85.79	0.4600	0.5524	0.5005	0.3259
	134112	92.0	110.0	100.60	0.3715	0.4622	0.4096	0.2650
	144112	110.0	120.0	114.89	0.2909	0.3744	0.3249	0.2119
	144122	120.0	140.0	129.61	0.2236	0.3333	0.2795	0.1752
	145132	140.0	160.0	149.67	0.1446	0.2463	0.1947	0.1105
	245232	160.0	210.0	183.30	0.1121	0.1919	0.1565	0.0811
	345342	210.0	260.0	233.67	0.0622	0.1260	0.1029	0.0472
	445443	260.0	300.0	279.29	0.0311	0.0632	0.0534	0.0221
	454454	300.0	340.0	319.37	0.0120	0.0313	0.0259	0.0115
	545454	340.0	420.0	377.89	0.0115	0.0304	0.0253	0.0098

Table I.1. Initial performance data, gun crew (Concluded).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TIME	CHIEF OF SECTION	GUNNER	ASSISTANT GUNNER	LOADER
1500- 3000	211111	0.4	0.6	0.52	0.7226	0.8320	0.8083	0.6814
	311111	0.6	0.8	0.71	0.6751	0.8106	0.7865	0.6487
	412111	0.6	1.1	0.96	0.5804	0.7432	0.7135	0.5415
	513111	1.1	1.4	1.24	0.4793	0.6618	0.6274	0.4304
	514111	1.4	1.8	1.59	0.4343	0.6050	0.5657	0.3588
	515211	1.8	2.3	2.03	0.3748	0.5020	0.4694	0.2543
	515321	2.3	2.7	2.49	0.2824	0.4146	0.3850	0.1813
	515331	2.7	5.4	3.62	0.2171	0.3717	0.3353	0.1489
	515332	5.4	6.6	5.97	0.1523	0.2759	0.2461	0.1012
	515333	6.6	8.0	7.27	0.1042	0.1971	0.1744	0.0677
	515334	8.0	20.0	12.65	0.0701	0.1366	0.1202	0.0447
	415334	20.0	24.0	21.91	0.0863	0.1547	0.1352	0.0513
	415324	24.0	32.0	27.71	0.1184	0.1798	0.1625	0.0641
	315314	32.0	50.0	40.00	0.1932	0.2330	0.2161	0.0913
	314414	50.0	72.0	60.00	0.2118	0.2461	0.2383	0.1004
	324513	72.0	86.0	76.69	0.2123	0.2288	0.2273	0.0960
	334513	86.0	96.0	90.86	0.1576	0.1713	0.1693	0.0734
	344413	96.0	110.0	102.76	0.1218	0.1461	0.1386	0.0670
	354523	110.0	140.0	124.10	0.0596	0.0773	0.0731	0.0336
	355533	140.0	170.0	154.27	0.0358	0.0519	0.0469	0.0199
	455543	170.0	220.0	193.39	0.0204	0.0380	0.0335	0.0137
	555554	220.0	270.0	243.72	0.0000	0.0000	0.0000	0.0000
	555555	270.0	300.0	264.61	0.0000	0.0000	0.0000	0.0000
3000- 4500	211111	0.3	0.4	0.32	0.7226	0.8320	0.8083	0.6814
	311111	0.4	0.5	0.42	0.6751	0.8106	0.7865	0.6487
	411111	0.5	0.6	0.52	0.6238	0.7871	0.7630	0.6146
	412111	0.6	0.7	0.61	0.5804	0.7432	0.7135	0.5415
	513111	0.7	0.8	0.71	0.4793	0.6618	0.6274	0.4304
	514111	0.8	0.9	0.80	0.4343	0.6050	0.5657	0.3588
	514211	0.8	0.9	0.87	0.4181	0.5630	0.5335	0.3152
	515211	0.9	1.1	0.99	0.3748	0.5020	0.4694	0.2543
	515321	1.1	1.3	1.20	0.2824	0.4146	0.3850	0.1813
	515431	1.3	2.7	1.87	0.2061	0.3322	0.3070	0.1257
	515431	2.7	4.2	3.37	0.1111	0.1944	0.1754	0.0741
	535432	4.2	5.0	4.58	0.0749	0.1345	0.1210	0.0490
	535433	5.0	5.6	5.29	0.0498	0.0910	0.0818	0.0321
	515434	5.6	6.6	6.08	0.0659	0.1174	0.1071	0.0370
	515435	6.6	26.0	13.10	0.0437	0.0789	0.0720	0.0242
	515425	26.0	30.0	27.93	0.0610	0.0930	0.0879	0.0304
	515525	30.0	33.0	31.46	0.0573	0.0794	0.0780	0.0251
	515515	33.0	55.0	42.60	0.0796	0.0936	0.0950	0.0316
	535515	55.0	70.0	62.05	0.0400	0.0477	0.0480	0.0178
	555515	70.0	91.0	79.81	0.0197	0.0237	0.0236	0.0100
	555525	91.0	110.0	100.05	0.0139	0.0199	0.0191	0.0079
	555535	110.0	120.0	114.89	0.0000	0.0000	0.0000	0.0000

Table I.2. Initial performance data, FDC.

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE	TIME	FIRE DIRECTION OFFICER	HORIZONTAL CONTROL OPERATOR	COMPUTER
75- 150	211111	5.0 18.0	9.49	0.8168	0.7479	0.8076
150- 300	211111	3.4 4.5	3.91	0.8168	0.7479	0.8076
	311111	4.5 5.0	4.74	0.7800	0.7105	0.7811
	312111	5.0 6.0	5.48	0.7678	0.6900	0.7682
	412111	6.0 6.6	6.39	0.7244	0.6480	0.7381
	413111	6.6 12.0	9.03	0.7102	0.6254	0.7236
	313111	12.0 16.0	13.86	0.7551	0.6687	0.7548
	213111	16.0 21.0	18.33	0.7950	0.7093	0.7836
	113111	21.0 40.0	28.98	0.8299	0.7468	0.8099
	112111	40.0 540.0	146.97	0.8395	0.7648	0.8210
	112121	540.0 1060.0	756.57	0.8043	0.7469	0.8131
300- 530	211111	1.8 2.7	2.20	0.8168	0.7479	0.8076
	311111	2.7 3.5	3.07	0.7800	0.7105	0.7811
	312111	3.5 3.9	3.69	0.7678	0.6900	0.7682
	412111	3.9 4.6	4.24	0.7244	0.6480	0.7381
	413111	4.6 6.6	5.51	0.7102	0.6254	0.7236
	414111	6.6 13.0	9.26	0.6957	0.6023	0.7086
	314112	13.0 22.0	16.91	0.6391	0.5705	0.6679
	214112	22.0 35.0	27.75	0.6902	0.6162	0.7029
	114112	35.0 40.0	37.42	0.7370	0.6599	0.7356
	114111	40.0 45.0	42.43	0.8198	0.7279	0.7983
	113111	45.0 320.0	120.00	0.8299	0.7468	0.8099
	114111	320.0 360.0	339.41	0.8198	0.7279	0.7983
	114121	360.0 450.0	402.49	0.7814	0.7082	0.7696
	114131	450.0 780.0	592.45	0.7375	0.6877	0.7807
	134131	780.0 1080.0	917.82	0.4958	0.5249	0.6045
530- 830	211111	1.2 1.7	1.43	0.8168	0.7479	0.8076
	311111	1.7 2.4	2.02	0.7800	0.7105	0.7811
	411111	2.4 2.7	2.55	0.7381	0.6700	0.7521
	412111	2.7 3.3	2.96	0.7244	0.6480	0.7381
	512111	3.3 3.5	3.37	0.6763	0.6037	0.7055
	513111	3.5 4.8	4.10	0.6609	0.5801	0.6900
	514111	4.8 10.0	6.93	0.6451	0.5561	0.6740
	414112	10.0 16.0	12.65	0.5847	0.5235	0.6310
	314112	16.0 26.0	20.40	0.6391	0.5705	0.6679
	214112	26.0 45.0	34.21	0.6902	0.6162	0.7029
	113112	45.0 50.0	47.43	0.7503	0.6815	0.7497
	113111	50.0 190.0	97.47	0.8299	0.7468	0.8099
	113121	190.0 250.0	217.95	0.7931	0.7279	0.8016
	114121	250.0 280.0	264.58	0.7814	0.7082	0.7896
	114131	280.0 410.0	336.82	0.7375	0.6877	0.7807
	214131	410.0 520.0	461.74	0.6907	0.6456	0.7516
	314133	520.0 630.0	572.36	0.4025	0.4423	0.5599
	424133	630.0 760.0	691.95	0.2406	0.3173	0.4148
	434143	760.0 910.0	831.62	0.1284	0.2300	0.3058
	484153	910.0 1080.0	991.36	0.0641	0.1610	0.2149

Table I.2. Initial performance data, FDC (Continued).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TIME	FIRE HORIZONTAL		COMPUTER
					DIRECTION OFFICER	CONTROL OPERATOR	
830- 1100	211111	0.9	1.3	1.08	0.8168	0.7479	0.8076
	311111	1.3	1.4	1.35	0.7800	0.7105	0.7811
	312111	1.4	1.8	1.59	0.7676	0.6900	0.7682
	413111	1.8	2.5	2.12	0.7102	0.6254	0.7236
	514111	2.5	3.2	2.83	0.6451	0.5561	0.6740
	515111	3.2	7.6	4.93	0.6290	0.5319	0.6576
	515112	7.6	9.0	6.27	0.5108	0.4519	0.5745
	515113	9.0	14.0	11.22	0.3913	0.3743	0.4871
	415113	14.0	22.0	17.55	0.4471	0.4196	0.5276
	315113	22.0	35.0	27.75	0.5043	0.4664	0.5678
	215113	35.0	50.0	41.83	0.5613	0.5137	0.6071
	214112	50.0	56.0	52.91	0.6902	0.6162	0.7029
	114112	56.0	67.0	61.25	0.7370	0.6599	0.7356
	114111	67.0	92.0	78.51	0.8198	0.7279	0.7983
	124111	92.0	110.0	100.60	0.7291	0.6545	0.7217
	134111	110.0	160.0	132.66	0.6142	0.5730	0.6295
	134121	160.0	180.0	169.71	0.5550	0.5491	0.6170
	234121	180.0	190.0	184.93	0.4987	0.5018	0.5780
	235121	190.0	200.0	194.94	0.4813	0.4774	0.5599
	235131	200.0	260.0	228.04	0.4217	0.4532	0.5469
	325232	260.0	320.0	248.44	0.3377	0.3804	0.4705
	315343	320.0	360.0	339.41	0.2605	0.3328	0.4219
	415343	360.0	410.0	384.19	0.2188	0.2921	0.3829
	415344	410.0	460.0	434.28	0.1471	0.2304	0.3037
	515354	460.0	520.0	489.08	0.0973	0.1835	0.2602
1100- 1500	211111	0.7	0.9	0.79	0.8168	0.7479	0.8076
	311111	0.9	1.0	0.95	0.7800	0.7105	0.7811
	312111	1.0	1.3	1.14	0.7678	0.6900	0.7682
	413111	1.3	1.7	1.49	0.7102	0.6254	0.7236
	514111	1.7	2.3	1.98	0.6451	0.5561	0.6740
	515111	2.3	5.3	3.49	0.6290	0.5319	0.6576
	515221	5.3	5.7	5.50	0.5295	0.4740	0.5950
	515222	5.7	8.0	6.75	0.4094	0.3954	0.5082
	515223	8.0	16.0	11.31	0.2992	0.3217	0.4208
	415223	16.0	25.0	20.00	0.3493	0.3644	0.4608
	315223	25.0	27.0	25.98	0.4031	0.4094	0.5013
	315113	27.0	40.0	32.86	0.5043	0.4664	0.5678
	215113	40.0	50.0	44.72	0.5613	0.5137	0.6071
	214113	50.0	66.0	57.45	0.5784	0.5381	0.6246
	114112	66.0	80.0	72.66	0.7370	0.6599	0.7356
	124112	80.0	92.0	85.79	0.6237	0.5789	0.6458
	134112	92.0	110.0	100.60	0.4951	0.4933	0.5483
	144112	110.0	120.0	114.89	0.3672	0.4062	0.4391
	144122	120.0	140.0	129.61	0.3172	0.3849	0.4261
	145132	140.0	160.0	149.67	0.2505	0.3399	0.3954
	245232	160.0	210.0	183.30	0.1833	0.2713	0.3097
	345342	210.0	260.0	233.67	0.1059	0.1964	0.2259
	445443	260.0	300.0	279.29	0.0467	0.1136	0.1234
	454454	300.0	340.0	319.37	0.0148	0.0618	0.0621
	545454	340.0	420.0	377.89	0.0185	0.0652	0.0739

Table I.2. Initial performance data, FDC (Concluded).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TIME	FIRE DIRECTION OFFICER	HORIZONTAL CONTROL OPERATOR	COMPUTER
1500- 3000	211111	0.4	0.6	0.52	0.8168	0.7479	0.8076
	311111	0.6	0.8	0.71	0.7800	0.7105	0.7811
	412111	0.8	1.1	0.96	0.7244	0.6480	0.7381
	513111	1.1	1.4	1.24	0.6609	0.5801	0.6900
	514111	1.4	1.8	1.59	0.6451	0.5561	0.6740
	515211	1.8	2.3	2.03	0.5888	0.4983	0.6077
	515321	2.3	2.7	2.49	0.4874	0.4407	0.5425
	515331	2.7	5.4	3.82	0.4276	0.4169	0.5293
	515332	5.4	6.6	5.97	0.3151	0.3415	0.4416
	515333	6.6	8.0	7.27	0.2208	0.2734	0.3574
	515334	8.0	20.0	12.65	0.1486	0.2144	0.2811
	415334	20.0	24.0	21.91	0.1800	0.2481	0.3150
	415324	24.0	32.0	27.71	0.2184	0.2667	0.3266
	315314	32.0	50.0	40.00	0.3090	0.3264	0.3755
	314414	50.0	72.0	60.00	0.2883	0.3184	0.3431
	324513	72.0	86.0	78.69	0.2474	0.2850	0.2620
	334513	86.0	96.0	90.86	0.1626	0.2202	0.2046
	344413	96.0	110.0	102.76	0.1199	0.1862	0.1728
	354523	110.0	140.0	124.10	0.0508	0.1139	0.0948
	355533	140.0	170.0	154.27	0.0377	0.0957	0.0845
	455543	170.0	220.0	193.39	0.0239	0.0735	0.0693
	555554	220.0	270.0	243.72	0.0000	0.0000	0.0000
	555555	270.0	300.0	284.81	0.0000	0.0000	0.0000
3000- 4500	211111	0.3	0.4	0.32	0.8168	0.7479	0.8076
	311111	0.4	0.5	0.42	0.7800	0.7105	0.7811
	411111	0.5	0.6	0.52	0.7381	0.6700	0.7521
	412111	0.6	0.7	0.61	0.7244	0.6480	0.7381
	513111	0.7	0.8	0.71	0.6609	0.5801	0.6900
	514111	0.8	0.8	0.80	0.6451	0.5561	0.6740
	514211	0.8	0.9	0.87	0.6056	0.5227	0.6252
	515211	0.9	1.1	0.99	0.5888	0.4983	0.6077
	515321	1.1	1.3	1.20	0.4874	0.4407	0.5425
	515431	1.3	2.7	1.87	0.3870	0.3846	0.4757
	535431	2.7	4.2	3.37	0.1810	0.2387	0.2803
	535432	4.2	5.0	4.58	0.1198	0.1853	0.2150
	535433	5.0	5.6	5.29	0.0773	0.1417	0.1615
	515434	5.6	6.6	6.08	0.1285	0.1927	0.2398
	515435	6.6	26.0	13.10	0.0833	0.1476	0.1816
	515425	26.0	30.0	27.93	0.1036	0.1602	0.1896
	515525	30.0	33.0	31.46	0.0889	0.1430	0.1588
	515515	33.0	55.0	42.60	0.1105	0.1553	0.1660
	535515	55.0	70.0	62.05	0.0417	0.0845	0.0787
	555515	70.0	91.0	79.81	0.0150	0.0442	0.0354
	555525	91.0	110.0	100.05	0.0118	0.0403	0.0336
	555535	110.0	120.0	114.89	0.0000	0.0000	0.0000

Table I.3. Initial performance data, tank crew.

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE	TIME	TANK COMMANDER	GUNNER	LOADER	DRIVER
75- 150	211111	5.0 18.0	9.49	0.8447	0.8853	0.8092	0.8744
150- 300	211111	3.4 4.5	3.91	0.8447	0.8853	0.8092	0.8744
	311111	4.5 5.0	4.74	0.8004	0.8501	0.7719	0.8494
	312111	5.0 6.0	5.48	0.7597	0.8252	0.7148	0.8054
	412111	6.0 6.8	6.39	0.6999	0.7762	0.6667	0.7702
	413111	6.8 12.0	9.03	0.6477	0.7428	0.5969	0.7110
	313111	12.0 16.0	13.86	0.7137	0.7971	0.6498	0.7523
	213111	16.0 21.0	18.33	0.7717	0.8424	0.6992	0.7895
	113111	21.0 40.0	28.98	0.8209	0.8791	0.7445	0.8224
	112111	40.0 540.0	146.97	0.8532	0.8973	0.7974	0.8632
	112121	540.0 1060.0	750.57	0.8477	0.9002	0.7964	0.8617
300- 530	211111	1.8 2.7	2.20	0.8447	0.8853	0.8092	0.8744
	311111	2.7 3.5	3.07	0.8004	0.8501	0.7719	0.8494
	312111	3.5 3.9	3.69	0.7597	0.8252	0.7148	0.8054
	412111	3.9 4.6	4.24	0.6999	0.7762	0.6667	0.7702
	413111	4.6 6.6	5.51	0.6477	0.7428	0.5969	0.7110
	414111	6.6 13.0	9.26	0.5917	0.7062	0.5230	0.6435
	314112	13.0 22.0	16.91	0.5495	0.6548	0.4495	0.5895
	214112	22.0 35.0	27.75	0.6232	0.7207	0.5057	0.6394
	114112	35.0 40.0	37.42	0.6916	0.7764	0.5617	0.6864
	114111	40.0 45.0	42.43	0.7832	0.8583	0.6832	0.7726
	113111	45.0 320.0	120.00	0.8209	0.8791	0.7445	0.8224
	114111	320.0 360.0	339.41	0.7832	0.8583	0.6832	0.7726
	114121	360.0 450.0	402.49	0.7757	0.8621	0.6819	0.7704
	114131	450.0 780.0	592.45	0.7680	0.8659	0.6806	0.7682
	134131	780.0 1080.0	917.82	0.5495	0.6660	0.4647	0.5460
530- 830	211111	1.2 1.7	1.43	0.8447	0.8853	0.8092	0.8744
	311111	1.7 2.4	2.02	0.8004	0.8501	0.7719	0.8494
	411111	2.4 2.7	2.55	0.7473	0.8065	0.7296	0.8204
	412111	2.7 3.3	2.96	0.6999	0.7762	0.6667	0.7702
	512111	3.3 3.5	3.37	0.6323	0.7183	0.6148	0.7308
	513111	3.5 4.8	4.10	0.5755	0.6797	0.5417	0.6658
	514111	4.8 10.0	6.93	0.5166	0.6385	0.4667	0.5938
	414112	10.0 16.0	12.65	0.4735	0.5823	0.3945	0.5377
	314112	16.0 26.0	20.40	0.5495	0.6548	0.4495	0.5895
	214112	26.0 45.0	34.21	0.6232	0.7207	0.5057	0.6394
	113112	45.0 50.0	47.43	0.7399	0.8084	0.6339	0.7489
	113111	50.0 190.0	97.47	0.8209	0.8791	0.7445	0.8224
	113121	190.0 250.0	217.95	0.8143	0.8825	0.7433	0.8206
	114121	250.0 280.0	264.58	0.7757	0.8621	0.6819	0.7704
	114131	280.0 410.0	338.82	0.7680	0.8659	0.6806	0.7682
	214131	410.0 520.0	461.74	0.7094	0.8260	0.6297	0.7286
	314133	520.0 630.0	572.36	0.4095	0.5398	0.3239	0.4744
	424133	630.0 760.0	691.95	0.2369	0.3249	0.1962	0.3058
	434143	760.0 910.0	831.62	0.1526	0.2172	0.1341	0.2076
	444153	910.0 1080.0	991.36	0.0949	0.1379	0.0895	0.1349

Table I.3. Initial performance data, tank crew (Continued).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TANK TIME COMMANDER		GUNNER	LOADER	DRIVER
830- 1100	211111	0.9	1.3	1.08	0.8447	0.8853	0.8092	0.8744
	311111	1.3	1.4	1.35	0.8004	0.8501	0.7719	0.8494
	312111	1.4	1.8	1.59	0.7597	0.8252	0.7148	0.8054
	413111	1.8	2.5	2.12	0.6477	0.7428	0.5969	0.7110
	514111	2.5	3.2	2.83	0.5166	0.6385	0.4667	0.5938
	515111	3.2	7.6	4.93	0.4573	0.5952	0.3931	0.5176
	515112	7.6	9.0	6.27	0.3434	0.4603	0.2780	0.4087
	515113	9.0	14.0	11.22	0.2450	0.3309	0.1862	0.3062
	415113	14.0	22.0	17.55	0.3056	0.4023	0.2228	0.3548
	315113	22.0	37.0	27.75	0.3737	0.4780	0.2643	0.4044
	215113	35.0	50.0	41.83	0.4473	0.5548	0.3104	0.4560
	214112	50.0	56.0	52.91	0.6232	0.7207	0.5057	0.6394
	114112	56.0	67.0	61.25	0.6916	0.7764	0.5617	0.6864
	114111	67.0	92.0	78.51	0.7832	0.8583	0.6632	0.7726
	124111	92.0	110.0	106.60	0.6866	0.7717	0.5793	0.6718
	134111	110.0	160.0	132.66	0.5711	0.6536	0.4678	0.5521
	134121	160.0	180.0	169.71	0.5603	0.6608	0.4663	0.5491
	234121	180.0	190.0	184.93	0.4845	0.5888	0.4108	0.4915
	235121	190.0	200.0	194.94	0.4256	0.5438	0.3404	0.4199
	235131	200.0	260.0	226.04	0.4147	0.5518	0.3391	0.4169
	325232	260.0	320.0	286.44	0.3089	0.4319	0.2412	0.3398
	315343	320.0	360.0	339.41	0.2677	0.3975	0.1970	0.3113
	415343	360.0	410.0	384.19	0.2124	0.3265	0.1637	0.2680
	415344	410.0	460.0	434.23	0.1434	0.2195	0.1042	0.1909
	515354	460.0	520.0	489.08	0.1056	0.1759	0.0645	0.1568
1100- 1500	211111	0.7	0.9	0.79	0.8447	0.8853	0.8092	0.8744
	311111	0.9	1.0	0.95	0.8004	0.8501	0.7719	0.8494
	312111	1.0	1.3	1.14	0.7597	0.8252	0.7148	0.8054
	413111	1.3	1.7	1.49	0.6477	0.7428	0.5969	0.7110
	514111	1.7	2.3	1.98	0.5166	0.6385	0.4667	0.5938
	515111	2.3	5.3	3.49	0.4573	0.5952	0.3931	0.5176
	515221	5.3	5.7	5.50	0.4026	0.5512	0.3494	0.4683
	515222	5.7	8.0	6.75	0.2950	0.4160	0.2419	0.3621
	515223	8.0	16.0	11.31	0.2061	0.2923	0.1594	0.2678
	415223	16.0	25.0	20.00	0.2604	0.3598	0.1920	0.3110
	315223	25.0	27.0	25.98	0.3232	0.4334	0.2294	0.3579
	315113	27.0	40.0	32.66	0.3737	0.4780	0.2643	0.4044
	215113	40.0	50.0	44.72	0.4473	0.5548	0.3104	0.4560
	214113	50.0	66.0	57.45	0.5055	0.5995	0.3781	0.5332
	114112	66.0	80.0	72.66	0.6916	0.7764	0.5617	0.6864
	124112	80.0	92.0	85.79	0.5765	0.6622	0.4500	0.5687
	134112	92.0	110.0	100.60	0.4525	0.5225	0.3431	0.4427
	144112	110.0	120.0	114.69	0.3341	0.3792	0.2501	0.3236
	144122	120.0	140.0	129.61	0.3244	0.3868	0.2489	0.3209
	145132	140.0	160.0	149.67	0.2659	0.3516	0.1960	0.2552
	245232	160.0	210.0	183.30	0.1826	0.2437	0.1397	0.1874
	345342	210.0	260.0	233.67	0.1164	0.1652	0.0970	0.1329
	445443	260.0	300.0	279.29	0.0480	0.0638	0.0406	0.0624
	454454	300.0	340.0	319.57	0.0225	0.0267	0.0212	0.0336
	545454	340.0	420.0	377.69	0.0216	0.0291	0.0196	0.0331

Table I.3. Initial performance data, tank crew (Concluded).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TANK				
				TIME	COMMANDER	GUNNER	LOADER	DRIVER
1500- 3000	211111	0.4	0.6	0.52	0.8447	0.8853	0.8092	0.8744
	311111	0.6	0.8	0.71	0.8004	0.8501	0.7719	0.8494
	412111	0.8	1.1	0.96	0.6999	0.7762	0.6667	0.7702
	513111	1.1	1.4	1.24	0.5755	0.6797	0.5417	0.6658
	514111	1.4	1.8	1.59	0.5166	0.6385	0.4667	0.5938
	515211	1.6	2.3	2.03	0.4132	0.5432	0.3508	0.4714
	515321	2.3	2.7	2.49	0.3604	0.4983	0.3094	0.4227
	515331	2.7	5.4	3.62	0.3503	0.5064	0.3081	0.4196
	515332	5.4	6.6	5.97	0.2508	0.3730	0.2092	0.3118
	515333	6.6	8.0	7.27	0.1720	0.2565	0.1359	0.2309
	515334	8.0	20.0	12.65	0.1142	0.1667	0.0854	0.1621
	415334	20.0	24.0	21.91	0.1488	0.2140	0.1046	0.1928
	415324	24.0	32.0	27.71	0.1545	0.2086	0.1054	0.1947
	315314	32.0	50.0	40.00	0.2056	0.2578	0.1293	0.2321
	314414	50.0	72.0	60.00	0.2153	0.2524	0.1433	0.2550
	324513	72.0	86.0	78.69	0.1833	0.2081	0.1304	0.2101
	334513	86.0	96.0	90.86	0.1199	0.1279	0.0874	0.1381
	344413	96.0	110.0	102.76	0.0900	0.0919	0.0682	0.1040
	354523	110.0	140.0	124.10	0.0456	0.0451	0.0373	0.0543
	355533	140.0	170.0	154.27	0.0350	0.0390	0.0277	0.0400
	455543	170.0	220.0	193.39	0.0250	0.0299	0.0221	0.0322
	555554	220.0	270.0	243.72	0.0000	0.0000	0.0000	0.0000
	555555	270.0	300.0	284.61	0.0000	0.0000	0.0000	0.0000
3000- 4500	211111	0.3	0.4	0.32	0.8447	0.8853	0.8092	0.8744
	311111	0.4	0.5	0.42	0.8004	0.8501	0.7719	0.8494
	411111	0.5	0.6	0.52	0.7473	0.8065	0.7298	0.8204
	412111	0.6	0.7	0.61	0.6999	0.7762	0.6667	0.7702
	513111	0.7	0.8	0.71	0.5755	0.6797	0.5417	0.6658
	514111	0.8	0.8	0.80	0.5166	0.6385	0.4667	0.5938
	514211	0.8	0.9	0.87	0.4718	0.5883	0.4219	0.5486
	515211	0.9	1.1	0.99	0.4132	0.5432	0.3508	0.4714
	515321	1.1	1.3	1.20	0.3604	0.4983	0.3094	0.4227
	515431	1.3	2.7	1.87	0.3107	0.4535	0.2708	0.3754
	535431	2.7	4.2	3.37	0.1425	0.2054	0.1315	0.1790
	535432	4.2	5.0	4.58	0.0935	0.1304	0.0825	0.1232
	535433	5.0	5.6	5.29	0.0602	0.0800	0.0507	0.0830
	515434	5.6	6.6	6.08	0.0973	0.1393	0.0723	0.1365
	515435	6.6	26.0	13.10	0.0627	0.0858	0.0443	0.0939
	515125	26.0	30.0	27.93	0.0653	0.0833	0.0445	0.0949
	515525	30.0	33.0	31.46	0.0552	0.0645	0.0374	0.0802
	515515	33.0	55.0	42.60	0.0575	0.0665	0.0376	0.0811
	535515	55.0	70.0	62.05	0.0220	0.0217	0.0157	0.0310
	555515	70.0	91.0	79.81	0.0082	0.0069	0.0065	0.0115
	555525	91.0	110.0	100.05	0.0079	0.0071	0.0064	0.0113
	555535	110.0	120.0	114.89	0.0000	0.0000	0.0000	0.0000

Table I.4. Initial performance data, TCW crew.

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE		TIME	SQUAD LEADER	GUNNER	DRIVER	LOADER
75- 150	211111	5.0	18.0	9.49	0.8714	0.8306	0.9456	0.8823
150- 300	211111	3.4	4.5	3.91	0.8714	0.8306	0.9456	0.8823
	311111	4.5	5.0	4.74	0.8435	0.7937	0.9315	0.8535
	312111	5.0	6.0	5.48	0.7884	0.7251	0.8932	0.7755
	412111	6.0	6.8	6.39	0.7477	0.6742	0.8676	0.7288
	413111	6.8	12.0	9.03	0.6721	0.5865	0.8012	0.6142
	313111	12.0	16.0	13.66	0.7205	0.6439	0.8373	0.6718
	213111	16.0	21.0	18.33	0.7043	0.6475	0.8579	0.7247
	113111	21.0	40.0	28.98	0.8030	0.7461	0.8935	0.7719
	112111	40.0	540.0	146.97	0.8550	0.8108	0.9317	0.8510
	112121	540.0	1060.0	756.57	0.7987	0.7418	0.8913	0.7944
300- 530	211111	1.8	2.7	2.20	0.8714	0.8306	0.9456	0.8823
	311111	2.7	3.5	3.07	0.8435	0.7937	0.9315	0.8535
	312111	3.5	3.9	3.69	0.7884	0.7251	0.8932	0.7755
	412111	3.9	4.6	4.24	0.7477	0.6742	0.8676	0.7288
	413111	4.6	6.6	5.51	0.6721	0.5865	0.8012	0.6142
	414111	6.6	13.0	9.26	0.5864	0.4930	0.7125	0.4854
	314112	13.0	22.0	16.91	0.5177	0.4334	0.6317	0.3943
	214112	22.0	35.0	27.75	0.5744	0.4937	0.6065	0.3556
	114112	35.0	40.0	37.42	0.6293	0.5542	0.7366	0.5163
	114111	40.0	45.0	42.43	0.7382	0.6683	0.8376	0.6572
	113111	45.0	320.0	120.00	0.8030	0.7461	0.8935	0.7719
	114111	320.0	360.0	339.41	0.7382	0.6683	0.8376	0.6672
	114121	360.0	450.0	402.49	0.6549	0.5746	0.7562	0.5756
	114131	450.0	780.0	592.45	0.5608	0.4751	0.6509	0.4715
	134131	780.0	1080.0	917.82	0.4272	0.3620	0.5061	0.3505
530- 830	211111	1.2	1.7	1.45	0.8714	0.8306	0.9456	0.8823
	311111	1.7	2.4	2.02	0.8435	0.7937	0.9315	0.8535
	411111	2.4	2.7	2.55	0.8108	0.7511	0.9142	0.8193
	412111	2.7	3.3	2.96	0.7477	0.6742	0.8676	0.7288
	512111	3.3	3.5	3.37	0.7021	0.6188	0.8112	0.6764
	513111	3.5	4.8	4.10	0.6193	0.5267	0.7594	0.5533
	514111	4.8	10.0	6.93	0.5299	0.4327	0.6599	0.4252
	414112	10.0	16.0	12.65	0.4605	0.3750	0.5733	0.3362
	314112	16.0	26.0	20.40	0.5177	0.4334	0.6317	0.3943
	214112	26.0	45.0	34.21	0.5744	0.4937	0.6066	0.3556
	113112	45.0	50.0	47.43	0.7105	0.6445	0.8198	0.6449
	113111	50.0	190.0	97.47	0.8030	0.7461	0.8935	0.7719
	113121	190.0	250.0	217.95	0.7329	0.6633	0.8345	0.6959
	114121	250.0	280.0	264.58	0.6549	0.5746	0.7562	0.5756
	114131	280.0	410.0	336.82	0.5608	0.4751	0.6509	0.4765
	214131	410.0	520.0	461.74	0.5036	0.4152	0.5936	0.4164
	314133	520.0	630.0	572.36	0.2264	0.1749	0.2516	0.1379
	424133	630.0	760.0	691.95	0.1510	0.1163	0.1633	0.0871
	434143	760.0	910.0	831.62	0.0636	0.0653	0.0800	0.0471
	444153	910.0	1080.0	991.36	0.0449	0.0358	0.0373	0.0250

Table 1.4. Initial performance data, TOW crew (Continued).

DOSE-RANGE RADS (CGY)	SYMP' OM COMPLET	TIME-RANGE		TIME	SQUAD LEADER	GUNNER	DRIVER	LOADER
830- 1100	211111	0.9	1.3	1.08	0.8714	0.8306	0.9456	0.8823
	311111	1.3	1.4	1.35	0.8435	0.7937	0.9315	0.8536
	312111	1.4	1.8	1.59	0.7884	0.7251	0.8932	0.7755
	413111	1.6	2.5	2.12	0.6721	0.5865	0.8012	0.6142
	514111	2.5	3.2	2.83	0.5299	0.4327	0.6599	0.4232
	515111	3.2	7.6	4.93	0.4381	0.3434	0.5441	0.3030
	515112	7.6	9.0	6.27	0.3194	0.2439	0.3929	0.1892
	515113	9.0	14.0	11.22	0.2203	0.1660	0.2597	0.1113
	415113	14.0	22.0	17.55	0.2622	0.2024	0.3094	0.1387
	315113	22.0	35.0	27.75	0.3089	0.2444	0.3639	0.1715
	215113	35.0	50.0	41.83	0.3596	0.2920	0.4221	0.2102
	214112	50.0	56.0	52.91	0.5744	0.4937	0.6866	0.4556
	114112	56.0	67.0	61.25	0.6293	0.5542	0.7366	0.5163
	114111	67.0	92.0	78.51	0.7382	0.6683	0.8376	0.6672
	124111	92.0	110.0	100.60	0.6830	0.6147	0.7927	0.6059
	134111	110.0	160.0	132.66	0.6222	0.5581	0.7392	0.5411
	134121	160.0	180.0	169.71	0.5257	0.4584	0.6302	0.4437
	234121	180.0	190.0	184.93	0.4685	0.3990	0.5717	0.3829
	235121	190.0	200.0	194.94	0.3787	0.3128	0.4508	0.2688
	235131	200.0	260.0	228.04	0.2909	0.2338	0.3304	0.1942
	325232	260.0	320.0	288.44	0.2130	0.1574	0.2430	0.1254
	315343	320.0	360.0	339.41	0.1312	0.0890	0.1382	0.0671
	415343	360.0	410.0	384.19	0.1072	0.0712	0.1116	0.0529
	415344	410.0	460.0	434.28	0.0674	0.0452	0.0637	0.0291
	515354	460.0	520.0	489.08	0.0373	0.0243	0.0311	0.0155
1100- 1500	211111	0.7	0.9	0.79	0.8714	0.8306	0.9456	0.8823
	311111	0.9	1.0	0.95	0.8435	0.7937	0.9315	0.8536
	312111	1.0	1.3	1.14	0.7884	0.7251	0.8932	0.7755
	413111	1.3	1.7	1.49	0.6721	0.5865	0.8012	0.6142
	514111	1.7	2.3	1.98	0.5299	0.4327	0.6599	0.4232
	515111	2.3	5.3	3.49	0.4381	0.3434	0.5441	0.3030
	515221	5.3	5.7	5.50	0.3559	0.2597	0.4490	0.2375
	515222	5.7	8.0	6.75	0.2496	0.1780	0.3064	0.1432
	515223	8.0	16.0	11.31	0.1666	0.1179	0.1933	0.0823
	415223	16.0	25.0	20.00	0.2012	0.1456	0.2342	0.1034
	315223	25.0	27.0	25.98	0.2405	0.1784	0.2809	0.1292
	315113	27.0	40.0	32.86	0.3089	0.2444	0.3639	0.1715
	215113	40.0	50.0	44.72	0.3596	0.2920	0.4221	0.2102
	214113	50.0	66.0	57.45	0.4483	0.3756	0.5429	0.3100
	114112	66.0	80.0	72.66	0.6293	0.5542	0.7366	0.5163
	124112	80.0	92.0	85.79	0.5647	0.4960	0.6746	0.4521
	134112	92.0	110.0	100.60	0.4979	0.4379	0.6058	0.3876
	144112	110.0	120.0	114.89	0.4311	0.3815	0.5326	0.3267
	144122	120.0	140.0	124.61	0.3377	0.2925	0.4065	0.2472
	145132	140.0	160.0	149.67	0.1918	0.1597	0.2021	0.1163
	245232	160.0	210.0	183.30	0.1656	0.1299	0.1838	0.0978
	345342	210.0	260.0	233.67	0.1007	0.0729	0.1075	0.0570
	445443	260.0	300.0	279.29	0.0534	0.0367	0.0549	0.0260
	454454	300.0	340.0	319.37	0.0246	0.0179	0.0223	0.0124
	545454	340.0	420.0	377.89	0.0179	0.0122	0.0146	0.0075

Table I.4. Initial performance data, TOW crew (Concluded).

DOSE-RANGE RADS (CGY)	SYMPTOM COMPLEX	TIME-RANGE	TIME	SQUAD LEADER	GUNNER	DRIVER	LOADER	
1500- 3000	211111	0.4	0.6	0.52	0.8714	0.8306	0.9456	0.8823
	311111	0.6	0.8	0.71	0.8435	0.7937	0.9315	0.8536
	412111	0.8	1.1	0.96	0.7477	0.6742	0.8676	0.7283
	513111	1.1	1.4	1.24	0.6198	0.5267	0.7594	0.5533
	514111	1.4	1.8	1.59	0.5299	0.4327	0.6599	0.4232
	515211	1.8	2.3	2.03	0.4509	0.3437	0.5755	0.3153
	515321	2.3	2.7	2.49	0.3678	0.2601	0.4207	0.2481
	515331	2.7	5.4	3.82	0.2814	0.1907	0.3575	0.1824
	515332	5.4	6.6	5.97	0.1908	0.1269	0.2318	0.1070
	515333	6.6	8.0	7.27	0.1243	0.0823	0.1406	0.0604
	515334	8.0	20.0	12.65	0.0787	0.0524	0.0615	0.0334
	415334	20.0	24.0	21.91	0.0970	0.0659	0.1017	0.0425
	415324	24.0	32.0	27.71	0.1377	0.0952	0.1585	0.0615
	315314	32.0	50.0	40.00	0.2298	0.1668	0.2857	0.1108
	314414	50.0	72.0	60.00	0.3123	0.2263	0.4249	0.1822
	324513	72.0	86.0	78.69	0.3778	0.2732	0.5343	0.2521
	334513	86.0	96.0	90.86	0.3169	0.2293	0.4596	0.2054
	344413	96.0	110.0	102.76	0.2519	0.1904	0.3569	0.1577
	354523	110.0	140.0	124.10	0.1542	0.1111	0.2193	0.0932
	355533	140.0	170.0	154.27	0.0782	0.0543	0.0941	0.0396
	455543	170.0	220.0	193.39	0.0435	0.0293	0.0466	0.0212
	555554	220.0	270.0	243.72	0.0000	0.0000	0.0000	0.0000
	555555	270.0	300.0	284.61	0.0000	0.0000	0.0000	0.0000
3000- 4500	211111	0.3	0.4	0.32	0.8714	0.8306	0.9456	0.8823
	311111	0.4	0.5	0.42	0.8435	0.7937	0.9315	0.8536
	411111	0.5	0.6	0.52	0.8198	0.7511	0.9142	0.8193
	412111	0.6	0.7	0.61	0.7477	0.6742	0.8676	0.7288
	513111	0.7	0.9	0.71	0.6198	0.5267	0.7594	0.5533
	514111	0.8	0.8	0.80	0.5299	0.4327	0.6599	0.4232
	514211	0.8	0.9	0.87	0.5428	0.4331	0.6879	0.4373
	515211	0.9	1.1	0.99	0.4509	0.3437	0.5755	0.3153
	515321	1.1	1.3	1.20	0.3678	0.2601	0.4807	0.2481
	515431	1.3	2.7	1.87	0.2919	0.1910	0.3872	0.1912
	535431	2.7	4.2	3.37	0.1941	0.1289	0.2578	0.1220
	535432	4.2	5.0	4.58	0.1266	0.0836	0.1584	0.0694
	535433	5.0	5.6	5.29	0.0803	0.0533	0.0926	0.0365
	515434	5.6	6.6	6.08	0.0825	0.0525	0.0915	0.0353
	515435	6.6	26.0	13.10	0.0514	0.0331	0.0518	0.0192
	515425	26.0	30.0	27.93	0.0745	0.0485	0.0833	0.0282
	515525	30.0	33.0	31.46	0.0781	0.0486	0.0935	0.0298
	515515	33.0	55.0	42.60	0.1118	0.0708	0.1465	0.0434
	535515	55.0	70.0	62.05	0.0685	0.0456	0.0862	0.0260
	555515	70.0	91.0	79.81	0.0412	0.0291	0.0493	0.0155
	555525	91.0	110.0	100.05	0.0281	0.0197	0.0302	0.0105
	555535	110.0	120.0	114.89	0.0000	0.0000	0.0000	0.0000

Appendix J

CREWMEMBER DOSE/TIME PERFORMANCE DATA

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Table J.1. Performance data for gun crew: chief of section.

GRID LINE	DUSE	LOG(UNSE)	TIME GRID LINES (HRS)												
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)
18	4529.03	3.06	1.0000	1.0000	0.0099	0.6263	0.4800	0.3635	0.2700	0.1767	0.1378	0.0909	0.0535	0.0237	0.0000
17	3516.74	3.55	1.0000	1.0000	1.0000	0.7262	0.6491	0.5677	0.4637	0.3972	0.2947	0.2577	0.2147	0.1710	0.1302
16	2720.55	3.44	1.0000	1.0000	1.0000	0.9772	0.7463	0.6305	0.5156	0.4990	0.3988	0.3647	0.3202	0.2266	0.1875
15	2118.41	3.33	1.0000	1.0000	1.0000	1.0000	0.8463	0.6941	0.6400	0.5650	0.4770	0.4348	0.3811	0.2811	0.2444
14	1648.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9184	0.6847	0.6154	0.5393	0.4749	0.4073	0.3345	0.3136
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7555	0.6691	0.6016	0.5193	0.4390	0.3689	0.3004
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8153	0.6789	0.6230	0.5452	0.4662	0.4210
11	769.24	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8045	0.6781	0.6278	0.5653	0.5104
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7949	0.7080	0.6419	0.5746
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9864	0.6804	0.6337
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9864	0.7769	0.6554
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9657	0.7425
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9334
5	168.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

GRID LINE	DUSE	LOG(UNSE)	TIME GRID LINES (HRS)												
			3.90 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)
18	4529.03	3.06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.74	3.55	0.1010	0.0686	0.0707	0.0606	0.0534	0.0468	0.0407	0.0353	0.0222	0.0647	0.0850	0.0741	0.0484
16	2729.55	3.44	0.1561	0.1233	0.1048	0.0762	0.0642	0.0585	0.0506	0.0670	0.0828	0.1051	0.1343	0.1410	0.1198
15	2118.41	3.33	0.2114	0.1780	0.1389	0.0915	0.0750	0.0702	0.0653	0.0787	0.1035	0.1457	0.1926	0.2079	0.2134
14	1648.72	3.22	0.2940	0.2552	0.1885	0.1252	0.1079	0.1051	0.1043	0.1250	0.1549	0.2172	0.2624	0.2890	0.3372
13	1276.71	3.11	0.3730	0.3310	0.2478	0.1660	0.1590	0.1530	0.1633	0.1655	0.2148	0.2854	0.3352	0.3701	0.4606
12	991.04	3.00	0.4039	0.3627	0.3403	0.2912	0.2326	0.2123	0.2328	0.2547	0.2779	0.3042	0.3352	0.4513	0.5543
11	769.24	2.89	0.4500	0.4325	0.4091	0.3704	0.3374	0.3172	0.3412	0.3656	0.3896	0.4143	0.4573	0.5494	0.6234
10	597.16	2.78	0.5071	0.4783	0.4609	0.4438	0.4255	0.3994	0.4143	0.4387	0.4647	0.4918	0.5331	0.6325	0.6650
9	463.54	2.67	0.5676	0.5213	0.5027	0.4859	0.4660	0.4393	0.4334	0.4556	0.4738	0.5062	0.5835	0.6745	0.6841
8	359.82	2.56	0.6225	0.5635	0.5332	0.5096	0.4929	0.4793	0.4633	0.4709	0.4992	0.5323	0.6157	0.6962	0.6994
7	279.31	2.45	0.6684	0.6069	0.5579	0.5248	0.5165	0.5211	0.5275	0.5497	0.5733	0.5992	0.6523	0.7101	0.7154
6	216.82	2.34	0.7143	0.6545	0.5825	0.5400	0.5401	0.5694	0.6022	0.6475	0.6717	0.6909	0.7082	0.7240	0.7304
5	168.70	2.23	0.8044	0.7802	0.6446	0.6068	0.5819	0.6428	0.6994	0.7496	0.8010	0.8288	0.8435	0.8588	0.8718
4	130.64	2.12	1.0000	0.9198	0.8150	0.7054	0.6531	0.7356	0.8054	0.8649	0.9315	0.9604	0.9843	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	0.9331	0.8310	0.7752	0.6482	0.9359	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	0.9729	0.9640	0.9757	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.1. Performance data for gun crew: chief of section (Concluded).

GRID LINE	DOSE LOG(DOSE)	TIME GRID LINES (HRS)											
		79.43 (1.9)	100.00 (2.0)	125.00 (2.1)	150.49 (2.2)	199.53 (2.3)	251.19 (2.4)	310.23 (2.5)	390.11 (2.6)	501.19 (2.7)	630.06 (2.8)	794.33 (2.9)	1000.00 (3.0)
10	4529.03	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.74	0.0350	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	0.1221	0.0411	0.0057	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.01	0.2004	0.1302	0.0573	0.0342	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	0.3011	0.2442	0.1209	0.0866	0.0258	0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	0.5122	0.3862	0.2547	0.1518	0.0730	0.0347	0.0164	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	0.6307	0.5516	0.4703	0.3907	0.3028	0.2157	0.1209	0.0676	0.0000	0.0000	0.0000	0.0000
11	769.29	0.6766	0.6388	0.6281	0.6205	0.6157	0.6129	0.6101	0.6073	0.6045	0.6017	0.5989	0.5961
10	597.10	0.6850	0.6940	0.6980	0.7020	0.7060	0.7100	0.7140	0.7180	0.7220	0.7260	0.7300	0.7340
9	403.54	0.6906	0.6938	0.6961	0.6984	0.7007	0.7030	0.7053	0.7076	0.7099	0.7122	0.7145	0.7168
8	359.02	0.6956	0.6978	0.6999	0.7020	0.7041	0.7062	0.7083	0.7104	0.7125	0.7146	0.7167	0.7188
7	279.31	0.7007	0.7028	0.7049	0.7070	0.7091	0.7112	0.7133	0.7154	0.7175	0.7196	0.7217	0.7238
6	216.82	0.7305	0.7309	0.7280	0.7252	0.7224	0.7196	0.7168	0.7140	0.7112	0.7084	0.7056	0.7028
5	163.70	0.8024	0.8910	0.8999	0.9065	0.9121	0.9177	0.9233	0.9289	0.9345	0.9401	0.9457	0.9513
4	130.64	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.2. Performance data for gun crew: gunner.

GRIP LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)											
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.1)	0.79 (0.0)	1.00 (0.2)	1.26 (0.4)	1.59 (0.7)	2.00 (0.9)	2.51 (1.2)
18	4529.03	3.66	1.0000	1.0000	0.4999	0.6263	0.4800	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0000
17	3516.34	3.55	1.0000	1.0000	1.0000	0.8978	0.6012	0.7318	0.6448	0.5370	0.4417	0.3993	0.3482	0.2303
16	2720.55	3.44	1.0000	1.0000	1.0000	0.9935	0.8532	0.7753	0.7514	0.6683	0.5834	0.5366	0.4821	0.3114
15	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.9069	0.8193	0.7503	0.7308	0.6587	0.6055	0.5106	0.3910
14	1644.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9518	0.8119	0.7669	0.7024	0.6409	0.5580	0.4104
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8522	0.8040	0.7465	0.6794	0.6085	0.5414
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8887	0.8091	0.7614	0.7004	0.5874
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8883	0.8030	0.7733	0.6733
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8774	0.8325	0.7432
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8677	0.7811
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9917	0.8671
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8773
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9599
5	169.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.01	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

GRIP LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)											
			3.94 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)
18	4529.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.34	3.55	0.1633	0.1273	0.1266	0.1097	0.0968	0.0854	0.0847	0.0916	0.0972	0.0892	0.0875	0.0512
16	2720.55	3.44	0.2759	0.2299	0.1903	0.1479	0.1216	0.1111	0.1114	0.1195	0.1328	0.1442	0.1670	0.1311
15	2118.81	3.33	0.3662	0.3236	0.2540	0.1761	0.1468	0.1369	0.1362	0.1475	0.1686	0.1994	0.2328	0.2459
14	1644.72	3.22	0.4363	0.4157	0.3195	0.2305	0.2010	0.1949	0.1946	0.2194	0.2436	0.2964	0.3308	0.4051
13	1276.71	3.11	0.5359	0.4941	0.3931	0.3119	0.2724	0.2616	0.2722	0.2928	0.3175	0.3881	0.4225	0.5605
12	991.04	3.00	0.6550	0.5380	0.4905	0.4336	0.3599	0.3312	0.3479	0.3663	0.3848	0.4081	0.4281	0.6424
11	769.29	2.89	0.6281	0.6003	0.5741	0.5383	0.4835	0.4546	0.4714	0.4880	0.5053	0.5220	0.5570	0.7104
10	597.16	2.78	0.6593	0.6550	0.6310	0.6072	0.5806	0.5472	0.5554	0.5692	0.5859	0.6029	0.6536	0.7537
9	463.54	2.67	0.7328	0.6896	0.6266	0.6403	0.6123	0.5822	0.5687	0.5732	0.5917	0.6120	0.6735	0.7720
8	359.82	2.56	0.7649	0.7239	0.6898	0.6637	0.6408	0.6187	0.5965	0.5971	0.6145	0.6344	0.6958	0.7767
7	279.31	2.45	0.7972	0.7581	0.7164	0.6851	0.6674	0.6608	0.6612	0.6715	0.6815	0.6955	0.7323	0.7838
6	216.82	2.34	0.8275	0.7922	0.7429	0.7084	0.6941	0.7391	0.7314	0.7514	0.7636	0.7746	0.7880	0.7947
5	169.70	2.23	0.8476	0.8099	0.7629	0.7259	0.7310	0.7682	0.8025	0.8315	0.8571	0.8726	0.7860	0.8057
4	130.64	2.12	1.0000	0.9517	0.8870	0.8196	0.7840	0.8348	0.8776	0.9142	0.9508	0.9712	0.9885	1.0000
3	101.01	2.01	1.0000	1.0000	0.9509	0.8977	0.8639	0.9081	0.9612	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	0.9876	0.9782	0.9853	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.2. Performance data for gun crew: gunner (Concluded).

GRID LINE	DUSE	LNG(DUSE)	TIME GRID LINES (HPS)											
			74.43 (1.0)	100.60 (2.0)	125.00 (2.1)	150.40 (2.2)	175.53 (2.3)	201.19 (2.4)	226.23 (2.5)	251.19 (2.6)	276.19 (2.7)	301.19 (2.8)	326.19 (2.9)	351.19 (3.0)
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.39	3.55	0.0401	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2720.55	3.44	0.1328	0.0456	0.0069	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.81	3.33	0.2260	0.1524	0.0748	0.0507	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1648.72	3.22	0.4167	0.3135	0.1921	0.1414	0.0540	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.6052	0.4770	0.3574	0.2489	0.1820	0.1126	0.0419	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.7214	0.6406	0.5096	0.5102	0.3981	0.3273	0.2248	0.1434	0.0000	0.0000	0.0000	0.0000
11	769.29	2.89	0.7585	0.7451	0.7236	0.7060	0.6226	0.5639	0.4944	0.4493	0.4419	0.0775	0.0000	0.0000
10	597.16	2.78	0.7688	0.7794	0.7851	0.7814	0.7635	0.7271	0.6844	0.6512	0.5682	0.4070	0.0000	0.0000
9	463.54	2.67	0.7752	0.7790	0.7809	0.7788	0.7704	0.7513	0.7228	0.6809	0.6352	0.5768	0.4916	0.4914
8	359.82	2.56	0.7824	0.7791	0.7773	0.7760	0.7773	0.7742	0.7542	0.7113	0.6973	0.6702	0.5986	0.2710
7	279.31	2.45	0.7907	0.7886	0.7825	0.7829	0.7874	0.7968	0.7882	0.7508	0.7563	0.7374	0.6830	0.5850
6	216.82	2.34	0.8074	0.8099	0.8115	0.8129	0.8146	0.8195	0.8202	0.8149	0.8154	0.8046	0.7714	0.7034
5	168.30	2.23	0.9160	0.9236	0.9307	0.9376	0.9443	0.9511	0.9579	0.9644	0.9707	0.9764	0.9813	0.9877
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.81	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.3. Performance data for gun crew: assistant gunner.

GRID
LINE UNSE LOG(UNSE)

TIME GRID LINES (HRS)

	0.20 (-0.7)	0.25 (-0.6)	0.30 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.60 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.20 (0.1)	1.50 (0.2)	2.00 (0.3)	2.50 (0.4)	3.10 (0.5)
18	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93
17	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34
16	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55
15	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81
14	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72
13	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71
12	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04
11	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29
10	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16
9	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54
8	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82
7	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31
6	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22
5	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30
4	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64
3	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81
2	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72
1	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11

GRID
LINE UNSE LOG(UNSE)

TIME GRID LINES (HRS)

	3.90 (0.6)	5.00 (0.7)	6.30 (0.8)	7.90 (0.9)	10.00 (1.0)	12.50 (1.1)	15.00 (1.2)	17.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)
18	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93	4529.93
17	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34	3516.34
16	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55	2729.55
15	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81	2119.81
14	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72	1649.72
13	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71	1276.71
12	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04	991.04
11	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29	769.29
10	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16	597.16
9	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54	463.54
8	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82	359.82
7	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31	279.31
6	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22	216.22
5	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30	168.30
4	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64	130.64
3	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81	101.81
2	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72	78.72
1	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11	61.11

Table J.3. Performance data for gun crew: assistant gunner (Concluded).

SPID LINE	LUSE	LOG(LUSE)	TIME GRID LINES (HRS)											
			74.43 (1.0)	100.00 (2.0)	125.39 (2.1)	150.49 (2.2)	174.53 (2.3)	251.19 (2.4)	316.23 (2.5)	398.11 (2.6)	501.19 (2.7)	630.96 (2.8)	794.33 (2.9)	1000.00 (3.0)
18	4529.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	5516.34	3.55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	3.48	0.1319	0.0465	0.0071	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2114.81	3.33	0.2243	0.1454	0.0706	0.0456	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1648.72	3.22	0.3045	0.2772	0.1633	0.1172	0.0431	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.5538	0.4258	0.3045	0.2010	0.1404	0.0921	0.0348	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.6769	0.5911	0.5106	0.4504	0.3349	0.2680	0.1848	0.1214	0.0000	0.0000	0.0000	0.0000
11	700.29	2.89	0.7206	0.7070	0.6794	0.6563	0.5707	0.5083	0.4437	0.4001	0.3869	0.0654	0.0000	0.0000
10	497.16	2.78	0.7327	0.7438	0.7494	0.7430	0.7214	0.6819	0.6352	0.5886	0.5013	0.3474	0.2734	0.0000
9	403.54	2.67	0.7593	0.7433	0.7450	0.7421	0.7325	0.7116	0.6827	0.6601	0.6406	0.5063	0.4043	0.2239
8	350.82	2.56	0.7467	0.7433	0.7436	0.7419	0.7364	0.7394	0.7178	0.7065	0.7092	0.6842	0.6291	0.5475
7	270.31	2.45	0.7553	0.7500	0.7483	0.7497	0.7523	0.7648	0.7536	0.7805	0.7776	0.7632	0.7339	0.6819
6	216.42	2.38	0.7760	0.7794	0.7815	0.7831	0.7850	0.7902	0.7894	0.9431	0.9306	0.9714	0.9743	0.9868
5	168.30	2.23	0.9023	0.9114	0.9197	0.9276	0.9354	0.9431	0.9506	1.0000	1.0000	1.0000	1.0000	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	74.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	51.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.4. Performance data for gun crew: loader.

GRID LINE	DUSE	LOG(DUSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.79 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4529.93	3.66	1.0000	1.0000	0.9099	0.6263	0.4000	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.34	3.55	1.0000	1.0000	1.0000	0.7014	0.6375	0.5272	0.3859	0.2739	0.1912	0.1601	0.1325	0.1051	0.0859	
16	2729.55	3.44	1.0000	1.0000	1.0000	0.9751	0.7290	0.5943	0.5011	0.3994	0.3090	0.2599	0.2021	0.1430	0.1247	
15	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.8234	0.6622	0.6100	0.5246	0.4265	0.3595	0.2627	0.1809	0.1635	
14	1648.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9094	0.6492	0.5792	0.4833	0.4014	0.3111	0.2412	0.2291	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7106	0.6361	0.5414	0.4485	0.3639	0.3125	0.2934	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7894	0.6447	0.5653	0.4772	0.3918	0.3404	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7871	0.6334	0.5855	0.5298	0.4504	
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7691	0.6885	0.6277	0.5452	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7893	0.6530	0.6026	
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9616	0.7671	
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9241	
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
5	168.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.81	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	DUSE	LOG(DUSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.34	3.55	0.0672	0.0452	0.0408	0.0347	0.0302	0.0264	0.0232	0.0202	0.0178	0.0158	0.0139	0.0121	0.0106	
16	2729.55	3.44	0.1053	0.0842	0.0664	0.0469	0.0393	0.0350	0.0315	0.0286	0.0259	0.0234	0.0211	0.0189	0.0170	
15	2118.81	3.33	0.1455	0.1232	0.0919	0.0592	0.0443	0.0448	0.0438	0.0420	0.0403	0.0387	0.0372	0.0357	0.0343	
14	1648.72	3.22	0.2128	0.1817	0.1257	0.0820	0.0709	0.0685	0.0669	0.0776	0.0897	0.1280	0.1486	0.1608	0.2124	
13	1276.71	3.11	0.2740	0.2394	0.1738	0.1269	0.1072	0.1018	0.1070	0.1173	0.1297	0.1750	0.2022	0.2342	0.3212	
12	991.04	3.00	0.3183	0.2858	0.2487	0.2091	0.1830	0.1446	0.1545	0.1648	0.1756	0.1925	0.2054	0.2147	0.3977	
11	769.29	2.89	0.3911	0.3505	0.3239	0.2914	0.2557	0.2359	0.2480	0.2620	0.2750	0.2884	0.3257	0.4174	0.4793	
10	597.16	2.78	0.4667	0.4168	0.3843	0.3587	0.3278	0.3061	0.3132	0.3257	0.3412	0.3572	0.4162	0.5030	0.5423	
9	463.54	2.67	0.5255	0.4644	0.4209	0.3920	0.3624	0.3360	0.3234	0.3291	0.3464	0.3660	0.4352	0.5403	0.5639	
8	359.82	2.56	0.5748	0.5116	0.4575	0.4252	0.3969	0.3691	0.3476	0.3500	0.3671	0.3874	0.4576	0.5658	0.5835	
7	279.31	2.45	0.6255	0.5601	0.4949	0.4571	0.4314	0.4146	0.4174	0.4286	0.4431	0.4601	0.5046	0.5876	0.6025	
6	216.82	2.34	0.6742	0.6149	0.5389	0.4849	0.4659	0.4842	0.5117	0.5376	0.5535	0.5695	0.5870	0.6094	0.6215	
5	168.70	2.23	0.8932	0.7590	0.6035	0.5626	0.5184	0.5777	0.6279	0.6655	0.7246	0.7552	0.7790	0.8003	0.8194	
4	130.64	2.12	1.0000	0.9107	0.7939	0.6682	0.6010	0.6916	0.7650	0.8245	0.9066	0.9447	0.9778	1.0000	1.0000	
3	101.81	2.01	1.0000	1.0000	0.9228	0.8060	0.7418	0.8256	0.9244	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9689	0.9586	0.9720	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.4. Performance data for gun crew: leader (Concluded).

GRID LINE	DUSE	LOG(DUSE)	TIME GRID LINES (HRS.)											
			79.43 (1.9)	100.00 (2.0)	125.89 (2.1)	158.49 (2.2)	199.53 (2.3)	251.19 (2.4)	316.27 (2.5)	398.11 (2.6)	501.19 (2.7)	630.96 (2.8)	794.53 (2.9)	1000.00 (3.0)
16	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.74	3.55	0.0169	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	2720.55	3.44	0.0558	0.0174	0.0024	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	2118.81	3.33	0.0952	0.0688	0.0323	0.0194	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	3.22	0.2308	0.1582	0.0917	0.0556	0.0344	0.0214	0.0150	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.4062	0.2768	0.1749	0.1143	0.0751	0.0414	0.0215	0.0000	0.0000	0.0000	0.0000	0.0000
12	971.04	3.00	0.4870	0.3451	0.2334	0.1503	0.0962	0.0614	0.0408	0.0245	0.0000	0.0000	0.0000	0.0000
11	769.29	2.89	0.5446	0.4289	0.3065	0.2011	0.1402	0.0972	0.0630	0.0425	0.0219	0.0000	0.0000	0.0000
10	597.16	2.78	0.5640	0.5172	0.5747	0.5747	0.5462	0.4912	0.4325	0.3630	0.3046	0.2422	0.1860	0.1209
9	463.54	2.67	0.5720	0.5767	0.5784	0.5744	0.5607	0.5345	0.4910	0.4225	0.3702	0.3040	0.2324	0.1650
8	359.82	2.56	0.5814	0.5781	0.5761	0.5746	0.5709	0.5656	0.5537	0.5416	0.5266	0.5098	0.4966	0.4822
7	270.31	2.45	0.5930	0.5867	0.5850	0.5850	0.5871	0.5960	0.6176	0.6589	0.7097	0.7698	0.8282	0.8858
6	216.82	2.34	0.6255	0.6322	0.6365	0.6399	0.6276	0.6084	0.5871	0.5616	0.5355	0.5097	0.4833	0.4577
5	164.30	2.23	0.8365	0.8521	0.8663	0.8779	0.8877	0.8984	0.9099	0.9222	0.9355	0.9497	0.9657	0.9833
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.5. Performance data for FDC crew: fire direction officer.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4529.03	3.66	1.0000	1.0000	0.8099	0.6263	0.4800	0.3635	0.2706	0.1961	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.34	3.55	1.0000	1.0000	1.0000	0.8190	0.7267	0.7163	0.6748	0.6161	0.5101	0.4634	0.4035	0.3142	0.2329	
16	2729.55	3.44	1.0000	1.0000	1.0000	0.9904	0.9562	0.9265	0.8765	0.7681	0.6015	0.5926	0.5386	0.4145	0.3579	
15	2118.91	3.33	1.0000	1.0000	1.0000	1.0000	0.8985	0.7946	0.7619	0.7147	0.6402	0.6453	0.5959	0.4866	0.4545	
14	1640.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9452	0.7901	0.7461	0.7115	0.6714	0.6204	0.5517	0.5404	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8584	0.7807	0.7449	0.6994	0.6480	0.6101	0.6092	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8779	0.7824	0.7610	0.7162	0.6661	0.6386	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8634	0.7902	0.7577	0.7149	0.6762	
10	537.10	2.74	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8634	0.7991	0.7308	0.7151	
9	403.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8522	0.7778	0.7540	
8	359.52	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9910	0.8450	0.7972	
7	270.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9762	0.8609	
6	216.62	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9559	
5	169.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.91	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4529.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.34	3.55	0.1702	0.1155	0.1393	0.1193	0.1040	0.0900	0.0733	0.1005	0.1087	0.1022	0.1218	0.0980	0.0215	
16	2729.55	3.44	0.3065	0.2430	0.2849	0.1573	0.1318	0.1198	0.1219	0.1346	0.1541	0.1768	0.2150	0.1982	0.1478	
15	2118.91	3.33	0.4213	0.3705	0.2689	0.1953	0.1508	0.1490	0.1507	0.1689	0.2009	0.2515	0.3084	0.3067	0.2637	
14	1640.72	3.22	0.5324	0.4839	0.3074	0.2623	0.2265	0.2197	0.2278	0.2601	0.3007	0.3730	0.4317	0.4426	0.4690	
13	1276.71	3.11	0.6159	0.5748	0.4589	0.3622	0.3154	0.3036	0.3211	0.3555	0.3994	0.4896	0.5469	0.5754	0.6506	
12	991.04	3.00	0.6332	0.6237	0.5724	0.5080	0.4238	0.3944	0.4223	0.4518	0.4826	0.5168	0.5309	0.6223	0.7404	
11	769.29	2.89	0.6506	0.6435	0.6210	0.5964	0.5379	0.5117	0.5383	0.5056	0.5709	0.6158	0.6498	0.7224	0.7773	
10	597.16	2.74	0.6781	0.6661	0.6613	0.6501	0.6324	0.6072	0.6171	0.6391	0.6630	0.6873	0.7338	0.7781	0.8014	
9	463.54	2.67	0.7190	0.6954	0.6921	0.6866	0.6739	0.6470	0.6345	0.6457	0.6716	0.7000	0.7626	0.8150	0.8210	
8	359.52	2.56	0.7505	0.7271	0.7098	0.7011	0.6929	0.6786	0.6615	0.6688	0.6936	0.7212	0.7677	0.8319	0.8320	
7	270.31	2.45	0.7810	0.7481	0.7184	0.7040	0.7044	0.7091	0.7135	0.7320	0.7492	0.7680	0.8130	0.8375	0.8379	
6	216.62	2.34	0.8097	0.7733	0.7271	0.7070	0.7159	0.7395	0.7694	0.7978	0.8149	0.8278	0.8383	0.8431	0.8477	
5	169.70	2.23	0.8372	0.8573	0.7996	0.7457	0.7371	0.7801	0.8256	0.8638	0.8885	0.9025	0.9125	0.9197	0.9253	
4	130.64	2.12	1.0000	0.9470	0.8784	0.8071	0.7783	0.8323	0.8631	0.9298	0.9616	0.9780	0.9912	1.0000	1.0000	
3	101.91	2.01	1.0000	1.0000	0.9559	0.8884	0.8515	0.8907	0.9217	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9821	0.9762	0.9839	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.5. Performance data for FDC crew: fire direction officer (Concluded).

GRIN LTIME	UNSE	LOG(UNSE)	TIME WIN LINES (HRS)											
			74.43 (1.0)	100.00 (2.0)	125.00 (2.1)	150.00 (2.2)	199.53 (2.3)	251.19 (2.4)	310.23 (2.5)	390.11 (2.6)	501.19 (2.7)	630.96 (2.8)	794.53 (2.9)	1000.00 (3.0)
10	4520.03	3.64	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.24	3.55	0.0316	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2720.55	3.48	0.1268	0.0314	0.0035	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.81	3.32	0.2429	0.1301	0.0503	0.0364	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1648.72	3.22	0.4099	0.3182	0.1005	0.1125	0.0429	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1274.71	3.11	0.6933	0.5119	0.3446	0.2504	0.1786	0.0971	0.0258	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.8104	0.7096	0.5067	0.3587	0.2425	0.1637	0.0963	0.0000	0.0000	0.0000	0.0000	0.0000
11	709.29	2.89	0.8172	0.8066	0.7703	0.7388	0.6844	0.6220	0.5631	0.5022	0.4763	0.4273	0.3156	0.2648
10	597.10	2.74	0.8194	0.8300	0.8249	0.8204	0.8153	0.8088	0.7989	0.7710	0.7263	0.6333	0.5190	0.4731
9	463.54	2.67	0.8258	0.8299	0.8312	0.8312	0.8309	0.8306	0.8274	0.7915	0.7680	0.7339	0.6276	0.4731
8	359.82	2.56	0.8319	0.8294	0.8345	0.8345	0.8340	0.8330	0.8338	0.8111	0.7978	0.7764	0.7069	0.5920
7	279.71	2.45	0.8375	0.8303	0.8345	0.8345	0.8371	0.8355	0.8338	0.8308	0.8276	0.8198	0.7863	0.7109
6	216.82	2.34	0.8430	0.8349	0.8384	0.8384	0.8407	0.8407	0.8407	0.8407	0.8407	0.8407	0.8407	0.8407
5	168.70	2.23	0.8503	0.8350	0.8397	0.8397	0.8407	0.8407	0.8407	0.8407	0.8407	0.8407	0.8407	0.8407
4	130.74	2.12	0.8500	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
3	101.41	2.01	0.8500	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
2	74.72	1.90	0.8500	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
1	51.11	1.79	0.8500	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400

Table J.6. Performance data for FDC crew: horizontal control operator.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.79 (-0.1)	1.00 (0.0)	1.24 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4529.93	3.66	1.0000	1.0000	0.8099	0.6263	0.4800	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	516.34	3.55	1.0000	1.0000	1.0000	0.7554	0.6907	0.6396	0.5960	0.5252	0.4608	0.4367	0.3946	0.3355	0.2826	
16	2729.55	3.44	1.0000	1.0000	1.0000	0.9796	0.7742	0.6822	0.6558	0.5938	0.5302	0.5202	0.4717	0.3953	0.3675	
15	2118.41	3.33	1.0000	1.0000	1.0000	1.0000	0.8603	0.7255	0.6402	0.6377	0.5789	0.5564	0.5037	0.4404	0.4277	
14	1644.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9268	0.7198	0.6723	0.6239	0.5841	0.5300	0.4826	0.4825	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7778	0.7091	0.6690	0.6145	0.5593	0.5252	0.5221	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8328	0.7141	0.6826	0.6317	0.5784	0.5483	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8180	0.7176	0.6823	0.6364	0.5952	
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8148	0.7345	0.6840	0.6414	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8016	0.7143	0.6623	
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9876	0.7988	0.7268	
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.7690	0.6114	
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9394	
5	168.30	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.44	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	76.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	DNSE	LOG(DNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	516.34	3.55	0.2373	0.1836	0.2091	0.1830	0.1682	0.1551	0.1367	0.1615	0.1664	0.1548	0.1664	0.1411	0.0980	
16	2729.55	3.44	0.3391	0.2972	0.2676	0.2182	0.1955	0.1840	0.1907	0.2015	0.2125	0.2216	0.2462	0.2354	0.2017	
15	2118.41	3.33	0.4136	0.3808	0.3226	0.2534	0.2228	0.2147	0.2247	0.2415	0.2586	0.2866	0.3260	0.3296	0.3151	
14	1644.72	3.22	0.4824	0.4519	0.3737	0.3000	0.2728	0.2701	0.2746	0.3050	0.3331	0.3758	0.4155	0.4307	0.4557	
13	1276.71	3.11	0.5274	0.5009	0.4259	0.3628	0.3316	0.3254	0.3397	0.3681	0.4056	0.4584	0.4991	0.5267	0.5933	
12	991.04	3.00	0.5396	0.5276	0.4937	0.4508	0.3956	0.3797	0.4015	0.4262	0.4510	0.4781	0.5048	0.5861	0.6628	
11	769.29	2.89	0.5627	0.5543	0.5387	0.5178	0.4819	0.4673	0.4898	0.5128	0.5345	0.5564	0.5887	0.6504	0.7027	
10	597.16	2.78	0.5986	0.5824	0.5735	0.5646	0.5544	0.5386	0.5311	0.5706	0.5918	0.6137	0.6555	0.7065	0.7262	
9	463.54	2.67	0.6410	0.6123	0.6042	0.5964	0.5859	0.5714	0.5652	0.5766	0.5994	0.6252	0.6791	0.7357	0.7410	
8	359.82	2.56	0.6788	0.6420	0.6284	0.6117	0.6034	0.5970	0.5953	0.5929	0.6155	0.6420	0.7029	0.7491	0.7497	
7	279.31	2.45	0.7091	0.6710	0.6373	0.6143	0.6167	0.6251	0.6273	0.6433	0.6630	0.6824	0.7272	0.7554	0.7564	
6	216.82	2.34	0.7394	0.7001	0.6503	0.6249	0.6300	0.6533	0.6929	0.7118	0.7303	0.7437	0.7591	0.7616	0.7631	
5	168.30	2.23	0.9143	0.8111	0.7417	0.6688	0.6533	0.7016	0.7486	0.7881	0.8360	0.8540	0.8674	0.8778	0.8868	
4	130.44	2.12	1.0000	0.9298	0.8405	0.7424	0.6990	0.7699	0.8306	0.8816	0.9436	0.9670	0.9867	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	0.9363	0.8465	0.7957	0.8620	0.9418	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	76.72	1.90	1.0000	1.0000	1.0000	0.9754	0.9672	0.9779	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.6. Performance data for FDC crew: horizontal control operator (Concluded).

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)											
			79.43 (1.9)	100.00 (2.0)	125.89 (2.1)	158.49 (2.2)	199.53 (2.3)	251.19 (2.4)	316.23 (2.5)	398.11 (2.6)	501.19 (2.7)	630.96 (2.8)	794.33 (2.9)	1000.00 (3.0)
18	4525.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.34	3.55	0.0636	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	3.44	0.1725	0.0661	0.0132	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.81	3.33	0.2816	0.1945	0.1133	0.0939	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	3.22	0.4560	0.3510	0.2462	0.2112	0.0946	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1216.71	3.11	0.6278	0.5072	0.4020	0.3342	0.2584	0.1779	0.0813	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.7189	0.6435	0.5695	0.5335	0.4522	0.3986	0.3261	0.2322	0.0000	0.0000	0.0000	0.0000
11	769.29	2.89	0.7340	0.7226	0.6993	0.6863	0.6393	0.6083	0.5659	0.5427	0.4867	0.0000	0.0000	0.0000
10	597.16	2.78	0.7391	0.7475	0.7505	0.7472	0.7373	0.7256	0.7085	0.6792	0.6107	0.4716	0.4182	0.0000
9	463.54	2.67	0.7440	0.7471	0.7492	0.7467	0.7425	0.7368	0.7237	0.6980	0.6719	0.6297	0.5462	0.2837
8	359.82	2.56	0.7489	0.7459	0.7435	0.7463	0.7473	0.7462	0.7381	0.7189	0.7072	0.6910	0.6243	0.4943
7	279.31	2.45	0.7538	0.7469	0.7439	0.7464	0.7512	0.7552	0.7511	0.7298	0.7347	0.7242	0.6795	0.5890
6	216.82	2.34	0.7613	0.7599	0.7597	0.7597	0.7611	0.7643	0.7640	0.7593	0.7622	0.7573	0.7347	0.6837
5	168.30	2.23	0.8950	0.9031	0.9111	0.9192	0.9273	0.9356	0.9441	0.9528	0.9615	0.9701	0.9780	0.9868
4	130.44	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.7. Performance data for FDC crew: computer.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.79 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.54 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
16	4520.93	3.65	1.0000	1.0000	0.8094	0.6253	0.4890	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.14	3.55	1.0000	1.0000	1.0000	0.8174	0.7673	0.7320	0.7118	0.6380	0.5695	0.5398	0.4907	0.4079	0.3375	
18	2729.55	3.44	1.0000	1.0000	1.0000	0.9898	0.8294	0.7616	0.7455	0.6984	0.6457	0.6361	0.5824	0.4818	0.3581	
19	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.8934	0.7918	0.7672	0.7307	0.6892	0.6742	0.6140	0.5425	0.4353	
20	1648.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9445	0.7874	0.7569	0.7245	0.6940	0.6443	0.5992	0.5022	
21	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8504	0.7806	0.7543	0.7157	0.6761	0.6473	0.6450	
22	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8725	0.7835	0.7631	0.7280	0.6898	0.6681	
23	768.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9607	0.7868	0.7623	0.7308	0.7008	
24	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8591	0.7955	0.7616	0.7327	
25	467.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8477	0.7822	0.7615	
26	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9905	0.8454	0.7949	
27	279.21	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9762	0.8566	
28	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9537	
29	168.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
30	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
31	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
32	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
33	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4520.93	3.65	0.0000	0.0000	0.2636	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
19	3516.14	3.55	0.2808	0.2145	0.2636	0.2286	0.2094	0.1923	0.1925	0.1959	0.1991	0.1737	0.1812	0.1474	0.0922	
20	2729.55	3.44	0.4278	0.3727	0.3496	0.3205	0.2914	0.2767	0.2439	0.2527	0.2606	0.2591	0.2783	0.2575	0.2026	
21	2118.81	3.33	0.5260	0.4892	0.4182	0.3325	0.2935	0.2812	0.2454	0.3096	0.3222	0.3447	0.3154	0.3677	0.3358	
22	1648.72	3.22	0.6324	0.5728	0.4796	0.3923	0.3598	0.3511	0.3670	0.3878	0.4114	0.4546	0.4897	0.4959	0.5043	
23	1276.71	3.11	0.6524	0.6258	0.5421	0.4710	0.4337	0.4266	0.4386	0.4651	0.4983	0.5581	0.5963	0.6199	0.6755	
24	991.04	3.00	0.6627	0.6503	0.6186	0.5728	0.5111	0.4901	0.5103	0.5315	0.5330	0.5758	0.6000	0.6148	0.7305	
25	768.29	2.89	0.6783	0.6726	0.6598	0.6308	0.5955	0.5765	0.5951	0.6140	0.6316	0.6485	0.6737	0.7274	0.7685	
26	597.16	2.78	0.7030	0.6421	0.6869	0.6776	0.6847	0.6859	0.6530	0.6679	0.6842	0.7009	0.7335	0.7708	0.7883	
27	467.54	2.67	0.7332	0.7136	0.7093	0.7084	0.6931	0.6719	0.6650	0.6723	0.6901	0.7097	0.7540	0.7992	0.8037	
28	359.82	2.56	0.7598	0.7345	0.7229	0.7146	0.7072	0.6969	0.6826	0.6862	0.7037	0.7227	0.7744	0.8118	0.8118	
29	279.21	2.45	0.7805	0.7505	0.7313	0.7166	0.7171	0.7201	0.7188	0.7292	0.7432	0.7573	0.7949	0.8152	0.8156	
30	216.82	2.34	0.8013	0.7744	0.7598	0.7428	0.7270	0.7244	0.7645	0.7849	0.7978	0.8069	0.8153	0.8187	0.8194	
31	168.70	2.23	0.8140	0.7872	0.7702	0.7529	0.7428	0.7404	0.7645	0.8442	0.8772	0.8902	0.8996	0.9070	0.9116	
32	130.64	2.12	0.8280	0.8472	0.8802	0.8856	0.7737	0.8273	0.8736	0.9128	0.9578	0.9752	0.9849	1.0000	1.0000	
33	101.41	2.01	0.8420	0.8533	0.8828	0.8828	0.8441	0.8947	0.9556	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
34	78.72	1.90	0.8560	0.8600	0.8828	0.8828	0.8441	0.8947	0.9556	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
35	61.11	1.79	0.8700	0.8700	0.8828	0.8828	0.8441	0.8947	0.9556	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.7. Performance data for FDC crew: computer (Concluded).

GRID LINE	DUSE	LNU(DUSE)	TIME GRID LINES (HRS)												
			79.43 (1.9)	100.00 (2.0)	125.89 (2.1)	150.78 (2.2)	194.53 (2.3)	251.19 (2.4)	316.23 (2.5)	396.11 (2.6)	501.19 (2.7)	630.96 (2.8)	794.33 (2.9)	1000.00 (3.0)	1256.93 (3.1)
18	4529.93	3.06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	5516.34	3.55	0.0551	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	3.44	0.1663	0.0545	0.0089	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.81	3.33	0.2779	0.1608	0.0988	0.0839	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	3.22	0.4919	0.3712	0.2591	0.2326	0.1058	0.0143	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.7013	0.5608	0.4416	0.3857	0.2965	0.2036	0.0871	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.7918	0.7102	0.6263	0.5469	0.5317	0.4041	0.4072	0.3048	0.0000	0.0000	0.0000	0.0000	0.0000
11	769.29	2.89	0.7979	0.7684	0.7628	0.7533	0.7244	0.7030	0.6705	0.6519	0.5974	0.1194	0.0000	0.0000	0.0000
10	557.16	2.78	0.8012	0.8106	0.8142	0.8128	0.8066	0.7960	0.7877	0.7765	0.7189	0.5880	0.5209	0.0000	0.0000
9	403.54	2.67	0.8068	0.8102	0.8115	0.8108	0.8079	0.8023	0.7958	0.7850	0.7717	0.7331	0.6549	0.3247	0.0914
8	359.82	2.56	0.8117	0.8101	0.8086	0.8094	0.8070	0.8047	0.8041	0.7939	0.7905	0.7793	0.7099	0.5555	0.2716
7	279.31	2.45	0.8157	0.8103	0.8090	0.8093	0.8080	0.8149	0.8126	0.8036	0.8058	0.8000	0.7541	0.6373	0.4458
6	216.82	2.34	0.8108	0.8171	0.8170	0.8171	0.8177	0.8211	0.8212	0.8174	0.8211	0.8207	0.7942	0.7192	0.6230
5	169.70	2.23	0.9109	0.9261	0.9325	0.9385	0.9438	0.9511	0.9576	0.9642	0.9710	0.9779	0.9833	0.9882	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.8. Performance data for tank crew: tank commander.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.79 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4529.93	3.66	1.0000	1.0000	0.8099	0.5263	0.4800	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.34	3.55	1.0000	1.0000	1.0000	0.8412	0.7688	0.6825	0.5579	0.4449	0.3825	0.3576	0.3133	0.2436	0.1844	
16	2729.55	3.44	1.0000	1.0000	1.0000	0.9227	0.8407	0.7500	0.6464	0.5896	0.4908	0.4535	0.3717	0.3024	0.2851	
15	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.9139	0.8178	0.7687	0.6809	0.5724	0.5172	0.4216	0.3605	0.3551	
14	1644.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9514	0.8043	0.7367	0.6494	0.5695	0.4693	0.4167	0.4129	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8630	0.7937	0.7259	0.6893	0.5230	0.4739	0.4591	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8954	0.8049	0.7468	0.6589	0.5594	0.5001	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8928	0.8022	0.7558	0.6771	0.5998	
10	597.10	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8814	0.8261	0.7656	0.6908	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8889	0.8039	0.7558	
8	359.02	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9224	0.8699	0.8216	
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9800	0.9385	
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9635	
5	168.30	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.34	3.55	0.1383	0.0911	0.1094	0.0905	0.0785	0.0685	0.0646	0.0705	0.0719	0.0647	0.0648	0.0526	0.0285	
16	2729.55	3.44	0.2545	0.1967	0.1728	0.1208	0.0994	0.0913	0.0940	0.1068	0.1121	0.1189	0.1371	0.1244	0.0981	
15	2118.81	3.33	0.3468	0.3023	0.2286	0.1506	0.1202	0.1142	0.1246	0.1432	0.1525	0.1777	0.2055	0.2189	0.2137	
14	1644.72	3.22	0.4134	0.3782	0.2615	0.1923	0.1634	0.1617	0.1735	0.2036	0.2367	0.2728	0.3163	0.3511	0.4036	
13	1276.71	3.11	0.4559	0.4295	0.3347	0.2518	0.2159	0.2089	0.2257	0.2636	0.3176	0.3672	0.4203	0.4805	0.5899	
12	991.04	3.00	0.4777	0.4523	0.4024	0.3438	0.2737	0.2334	0.2825	0.3179	0.3540	0.3920	0.4321	0.5723	0.6951	
11	769.29	2.89	0.5374	0.5094	0.4784	0.4429	0.4010	0.3853	0.4200	0.4550	0.4886	0.5230	0.5774	0.6830	0.7620	
10	597.10	2.78	0.6097	0.5704	0.5495	0.5365	0.5114	0.4909	0.5171	0.5498	0.5839	0.6194	0.6868	0.7744	0.8009	
9	463.54	2.67	0.6824	0.6284	0.6025	0.5831	0.5625	0.5383	0.5374	0.5598	0.5964	0.6374	0.7185	0.8087	0.8213	
8	359.02	2.56	0.7448	0.6819	0.6411	0.6134	0.5960	0.5824	0.5798	0.5999	0.6361	0.6715	0.7486	0.8236	0.8314	
7	279.31	2.45	0.7907	0.7316	0.6716	0.6316	0.6249	0.6329	0.6573	0.6880	0.7191	0.7422	0.7854	0.8324	0.8301	
6	216.82	2.34	0.8367	0.7817	0.7020	0.6529	0.6338	0.6890	0.7348	0.7761	0.8021	0.8191	0.8316	0.8413	0.8488	
5	168.30	2.23	0.9471	0.8691	0.7872	0.7336	0.7086	0.7638	0.8109	0.8547	0.8853	0.8982	0.9102	0.9185	0.9254	
4	130.64	2.12	1.0000	0.9495	0.8775	0.8201	0.7822	0.8398	0.8868	0.9323	0.9657	0.9770	0.9910	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	0.9636	0.9061	0.8741	0.9177	0.9641	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9879	0.9798	0.9887	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.8. Performance data for tank crew: tank commander (Concluded).

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)											
			79.43 (1.9)	100.00 (2.0)	125.00 (2.1)	150.00 (2.2)	175.53 (2.3)	201.19 (2.4)	226.23 (2.5)	250.11 (2.6)	271.19 (2.7)	294.96 (2.8)	318.33 (2.9)	340.93 (3.1)
16	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.34	3.55	0.0177	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
18	2720.55	3.43	0.0775	0.0210	0.0020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
15	2118.81	3.33	0.1002	0.0472	0.0450	0.0301	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
14	1648.72	3.22	0.4149	0.2754	0.1628	0.1159	0.0485	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
13	1276.71	3.11	0.6460	0.4709	0.3422	0.2610	0.1721	0.1014	0.0325	0.0000	0.0000	0.0000	0.0000	
12	991.04	3.00	0.7724	0.6674	0.5678	0.5329	0.3954	0.3408	0.2528	0.1579	0.0000	0.0000	0.0000	
11	789.29	2.90	0.9025	0.7856	0.7544	0.7449	0.6606	0.6162	0.5717	0.5242	0.4905	0.4769	0.4600	
10	597.10	2.78	0.9123	0.8224	0.8307	0.8322	0.8212	0.7880	0.7732	0.7586	0.7413	0.7250	0.7090	
9	463.54	2.67	0.9206	0.8224	0.8242	0.8213	0.8119	0.7932	0.7813	0.7695	0.7586	0.7478	0.7369	
8	350.82	2.56	0.9203	0.8227	0.8181	0.8172	0.8047	0.7975	0.7901	0.7817	0.7717	0.7607	0.7496	
7	270.31	2.45	0.9378	0.8276	0.8224	0.8179	0.8143	0.8149	0.8107	0.8064	0.8022	0.7980	0.7938	
6	216.82	2.34	0.9464	0.8461	0.8475	0.8488	0.8503	0.8523	0.8538	0.8553	0.8567	0.8581	0.8595	
5	168.30	2.23	0.9521	0.9381	0.9440	0.9498	0.9555	0.9611	0.9667	0.9722	0.9776	0.9830	0.9884	
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.01	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.9. Performance data for tank crew: gunner.

UPIN LTIME	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.50 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4529.93	3.66	1.0000	1.0000	0.8099	0.6263	0.4800	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.74	3.55	1.0000	1.0000	1.0000	0.8084	0.6229	0.4765	0.3603	0.2601	0.1844	0.1247	0.0812	0.0504	0.0290	
16	2720.55	3.44	1.0000	1.0000	1.0000	0.9977	0.8191	0.6130	0.4649	0.3426	0.2508	0.1790	0.1243	0.0849	0.0515	
15	2118.91	3.33	1.0000	1.0000	1.0000	1.0000	0.9364	0.8368	0.7278	0.6115	0.5070	0.4130	0.3278	0.2538	0.1948	
14	1644.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9637	0.8574	0.7437	0.6310	0.5200	0.4196	0.3250	0.2463	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9408	0.8460	0.7416	0.6386	0.5344	0.4324	0.3427	
12	941.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9226	0.8548	0.7854	0.7152	0.6428	0.5727	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9179	0.8585	0.7990	0.7368	0.6790	
10	597.10	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9119	0.8696	0.8210	0.7662	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9172	0.8523	0.7862	
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9044	0.8331	0.7660	
7	279.71	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9851	0.9168	
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9730	
5	168.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.44	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

UPIN LTIME	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.94 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.65 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.74	3.55	0.1971	0.1267	0.1501	0.1290	0.1105	0.0948	0.0813	0.0691	0.0586	0.0491	0.0412	0.0344	0.0290	
16	2720.55	3.44	0.3608	0.2861	0.2630	0.1766	0.1462	0.1306	0.1198	0.1102	0.1025	0.0941	0.0871	0.0812	0.0760	
15	2118.91	3.33	0.5021	0.4453	0.3405	0.2487	0.1781	0.1668	0.1645	0.2063	0.2114	0.2269	0.2378	0.2638	0.2948	
14	1644.72	3.22	0.5693	0.5331	0.4027	0.2829	0.2415	0.2315	0.2517	0.2855	0.3214	0.3531	0.3966	0.4250	0.4673	
13	1276.71	3.11	0.5999	0.5797	0.4654	0.3583	0.3067	0.2951	0.3147	0.3629	0.4260	0.4728	0.5267	0.5815	0.6406	
12	941.04	3.00	0.6107	0.5915	0.5553	0.4633	0.3719	0.3424	0.3148	0.4171	0.4575	0.4979	0.5400	0.6723	0.7816	
11	769.29	2.89	0.6507	0.6348	0.6049	0.5670	0.5123	0.4667	0.5260	0.5579	0.5911	0.6247	0.6713	0.7630	0.8695	
10	597.10	2.78	0.7056	0.6816	0.6670	0.6312	0.6331	0.6077	0.5269	0.6550	0.6857	0.7169	0.7723	0.8309	0.9055	
9	463.54	2.67	0.7632	0.7259	0.7120	0.6906	0.6812	0.6544	0.6449	0.6641	0.6972	0.7329	0.8005	0.8725	0.9539	
8	359.82	2.56	0.8114	0.7655	0.7406	0.7214	0.7076	0.6959	0.6851	0.6981	0.7303	0.7696	0.8287	0.8843	0.9525	
7	279.71	2.45	0.8449	0.8015	0.7595	0.7326	0.7283	0.7372	0.7492	0.7717	0.7977	0.8212	0.8570	0.8870	0.9321	
6	216.82	2.34	0.8784	0.8374	0.7785	0.7439	0.7489	0.7784	0.8133	0.8452	0.8651	0.8778	0.8852	0.8898	0.8917	
5	168.70	2.23	0.9006	0.8987	0.8417	0.8032	0.7876	0.8107	0.8608	0.9034	0.9291	0.9333	0.9384	0.9455	0.9481	
4	130.44	2.12	1.0000	0.9624	0.9090	0.8671	0.8402	0.8440	0.9163	0.9534	0.9822	0.9880	0.9938	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	0.9731	0.9307	0.9070	0.9373	0.9735	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9910	0.9851	0.9905	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.9. Performance data for tank crew: gunner (Concluded).

WPIN LINE	UNSE	LOG(UNSE)	TIME WPID LINES (HRS)											
			79.43 (1.9)	100.00 (2.0)	125.89 (2.1)	150.40 (2.2)	199.53 (2.3)	251.19 (2.4)	310.23 (2.5)	398.11 (2.6)	501.19 (2.7)	630.96 (2.8)	774.33 (2.9)	1000.00 (3.0)
18	4529.03	3.64	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.14	3.55	0.0152	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	3.44	0.0793	0.0195	0.0022	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2114.41	3.33	0.2041	0.1004	0.0451	0.0386	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1648.72	3.22	0.4729	0.3220	0.1909	0.1506	0.0684	0.0070	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.7358	0.5435	0.4018	0.3407	0.2354	0.1460	0.0562	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.9505	0.7501	0.6484	0.6264	0.5139	0.4666	0.3741	0.2502	0.0000	0.0000	0.0000	0.0000
11	769.29	2.89	0.8631	0.6551	0.4251	0.4242	0.7691	0.7448	0.6460	0.6506	0.6109	0.1044	0.0000	0.0000
10	547.16	2.78	0.8728	0.6834	0.8842	0.8482	0.8846	0.8670	0.8319	0.8614	0.7723	0.5527	0.4658	0.0000
9	403.54	2.67	0.8860	0.8043	0.8820	0.8709	0.8709	0.8653	0.8613	0.8617	0.8467	0.7807	0.6988	0.3570
8	359.82	2.54	0.8940	0.8590	0.8773	0.8734	0.8669	0.8645	0.8604	0.8631	0.8730	0.8641	0.7867	0.6066
7	279.31	2.45	0.8436	0.8918	0.8773	0.8734	0.8715	0.8722	0.8696	0.8723	0.8885	0.8846	0.8335	0.6858
6	214.82	2.34	0.8932	0.8945	0.8433	0.8483	0.8955	0.8970	0.8981	0.8997	0.9041	0.9051	0.8804	0.7651
5	168.30	2.23	0.9524	0.9567	0.9608	0.9649	0.9689	0.9728	0.9748	0.9807	0.9845	0.9884	0.9902	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.10. Performance data for tank crew: loader.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.79 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4529.93	3.66	1.0000	1.0000	0.8099	0.6265	0.4800	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	5516.74	3.55	1.0000	1.0000	1.0000	0.8093	0.7506	0.6494	0.5072	0.3745	0.3114	0.3103	0.2642	0.2098	0.1669	
16	2720.55	3.44	1.0000	1.0000	1.0000	0.9379	0.8215	0.7179	0.6529	0.5310	0.4508	0.4011	0.3122	0.2597	0.2490	
15	2118.91	3.33	1.0000	1.0000	1.0000	1.0000	0.8943	0.7868	0.7308	0.6476	0.5376	0.4674	0.3600	0.3096	0.3089	
14	1646.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9431	0.7757	0.7046	0.6073	0.5193	0.4081	0.3686	0.3623	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8320	0.7627	0.6777	0.5762	0.4736	0.4350	0.4071	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8726	0.7722	0.7014	0.6082	0.5100	0.4474	
11	709.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8760	0.7719	0.7179	0.6462	0.5633	
10	597.10	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8580	0.7997	0.7452	0.6641	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8886	0.7758	0.7263	
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9906	0.8452	0.7888	
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9762	0.8609	
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9718	
5	168.30	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.01	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.98 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	5516.74	3.55	0.1249	0.0785	0.0627	0.0669	0.0571	0.0489	0.0443	0.0400	0.0493	0.0435	0.0449	0.0348	0.0196	
16	2720.55	3.44	0.2267	0.1693	0.1401	0.0921	0.0742	0.0672	0.0709	0.0753	0.0773	0.0748	0.0870	0.0790	0.0630	
15	2118.91	3.33	0.3039	0.2000	0.1888	0.1171	0.0913	0.0855	0.0936	0.1017	0.1054	0.1143	0.1294	0.1405	0.1400	
14	1646.72	3.22	0.3483	0.3191	0.2547	0.1316	0.1265	0.1230	0.1314	0.1483	0.1671	0.1890	0.2140	0.2366	0.3031	
13	1276.71	3.11	0.3637	0.3604	0.2907	0.2009	0.1686	0.1600	0.1703	0.1942	0.2263	0.2596	0.2932	0.3410	0.4599	
12	991.04	3.00	0.4177	0.3875	0.3368	0.2746	0.2138	0.1907	0.2092	0.2299	0.2518	0.2755	0.2997	0.4479	0.5657	
11	709.29	2.89	0.4483	0.4608	0.4238	0.3633	0.3375	0.3125	0.3359	0.3597	0.3830	0.4071	0.4367	0.5721	0.6536	
10	597.10	2.78	0.5012	0.5320	0.5015	0.4734	0.4432	0.4115	0.4268	0.4494	0.4756	0.5027	0.5760	0.6760	0.7154	
9	463.54	2.67	0.6508	0.5364	0.5492	0.5214	0.4882	0.4554	0.4435	0.4560	0.4847	0.5172	0.6043	0.7222	0.7489	
8	359.82	2.56	0.7068	0.6394	0.5895	0.5345	0.5268	0.5019	0.4824	0.4959	0.5202	0.5519	0.6362	0.7439	0.7682	
7	279.31	2.45	0.7593	0.6924	0.6282	0.5830	0.5629	0.5600	0.5724	0.5944	0.6170	0.6380	0.6870	0.7581	0.7721	
6	216.82	2.34	0.8017	0.7455	0.6868	0.6114	0.5991	0.6265	0.6655	0.7010	0.7234	0.7412	0.7561	0.7723	0.7801	
5	168.30	2.23	0.9355	0.8412	0.7605	0.6911	0.6583	0.7158	0.7592	0.8036	0.8331	0.8538	0.8703	0.8837	0.8945	
4	130.64	2.12	1.0000	0.9410	0.8594	0.7867	0.7394	0.8059	0.8555	0.9063	0.9426	0.9670	0.9870	1.0000	1.0000	
3	101.01	2.01	1.0000	1.0000	0.9546	0.8838	0.8454	0.8959	0.9559	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9614	0.9752	0.9851	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.1). Performance data for tank crew: Loader (Concluded).

GRIP LINE	DUSE	LOG(DUSE)	TIME GRIP LINES (MRS)													
			79.43 (1.0)	100.00 (2.0)	125.00 (2.1)	150.00 (2.2)	175.00 (2.3)	200.00 (2.4)	225.00 (2.5)	250.00 (2.6)	275.00 (2.7)	300.00 (2.8)	325.00 (2.9)	350.00 (3.0)	375.00 (3.1)	400.00 (3.2)
18	4520.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.14	3.55	0.0138	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	3.44	0.0569	0.0154	0.0021	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.01	3.33	0.1285	0.0729	0.0364	0.0273	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1648.72	3.22	0.3218	0.1937	0.1213	0.0847	0.0570	0.0411	0.0285	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.5118	0.3607	0.2629	0.1947	0.1342	0.0835	0.0497	0.0191	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	3.00	0.6659	0.5596	0.4639	0.4394	0.3147	0.2723	0.1897	0.1191	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
11	700.24	2.89	0.7113	0.6966	0.6608	0.6658	0.5870	0.5347	0.4905	0.4562	0.4200	0.3614	0.3000	0.2499	0.2000	0.1500
10	597.16	2.78	0.7353	0.7479	0.7597	0.7635	0.7498	0.6980	0.6822	0.6732	0.6410	0.5654	0.4750	0.3850	0.2950	0.2050
9	483.54	2.67	0.7670	0.7556	0.7459	0.7247	0.7126	0.7069	0.6924	0.6897	0.7024	0.7475	0.7927	0.8379	0.8831	0.9283
8	359.82	2.56	0.7762	0.7623	0.7479	0.7387	0.7332	0.7339	0.7288	0.7279	0.7572	0.7883	0.8190	0.8500	0.8810	0.9120
7	279.31	2.45	0.7854	0.7857	0.7891	0.7900	0.7937	0.7979	0.8010	0.8043	0.8121	0.8083	0.7780	0.7467	0.7150	0.6833
6	216.92	2.34	0.9047	0.9138	0.9224	0.9308	0.9390	0.9470	0.9549	0.9627	0.9701	0.9768	0.9819	0.9879	0.9930	0.9980
5	168.30	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.01	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.11. Performance data for tank crew: driver.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.30 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.60 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4520.93	3.66	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
17	3516.74	3.55	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
16	2729.55	3.44	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
15	2118.81	3.33	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
14	1648.72	3.23	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
13	1276.71	3.11	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
12	991.04	3.00	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
11	769.29	2.89	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
10	597.18	2.78	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
9	463.54	2.67	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
8	350.82	2.56	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
7	270.31	2.45	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
6	216.82	2.34	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
5	168.30	2.23	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
4	130.64	2.12	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
3	101.41	2.01	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
2	78.72	1.90	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	
1	61.11	1.79	1.0000	1.0000	0.8000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0277	0.0000	

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.98 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4520.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.74	3.55	0.1766	0.1200	0.1354	0.1296	0.1145	0.1014	0.1006	0.1019	0.1027	0.0904	0.0929	0.0727	0.0398	
16	2729.55	3.44	0.3152	0.2461	0.2349	0.1883	0.1430	0.1317	0.1377	0.1448	0.1484	0.1494	0.1624	0.1553	0.1261	
15	2118.81	3.33	0.4160	0.3721	0.2936	0.2070	0.1715	0.1621	0.1749	0.1878	0.1943	0.2066	0.2321	0.2513	0.2531	
14	1648.72	3.23	0.4703	0.4468	0.3472	0.2550	0.2223	0.2163	0.2255	0.2514	0.2756	0.3060	0.3379	0.3721	0.4298	
13	1276.71	3.11	0.5084	0.4868	0.4010	0.3179	0.2793	0.2698	0.2800	0.3140	0.3538	0.3981	0.4371	0.4911	0.6020	
12	991.04	3.00	0.5431	0.5121	0.4645	0.4044	0.3379	0.3145	0.3360	0.3630	0.3893	0.4173	0.4451	0.5844	0.6882	
11	769.29	2.89	0.6224	0.5841	0.5506	0.5132	0.4680	0.4494	0.4728	0.4976	0.5210	0.5468	0.5902	0.6937	0.7595	
10	597.18	2.78	0.7013	0.6591	0.6255	0.6003	0.5749	0.5515	0.5078	0.5895	0.6128	0.6366	0.6977	0.7746	0.8661	
9	463.54	2.67	0.7578	0.7036	0.6667	0.6416	0.6133	0.5877	0.5824	0.5958	0.6211	0.6492	0.7171	0.8057	0.8264	
8	350.82	2.56	0.7996	0.7466	0.7025	0.6712	0.6478	0.6273	0.6193	0.6306	0.6546	0.6776	0.7401	0.8194	0.8365	
7	270.31	2.45	0.8384	0.7870	0.7362	0.6940	0.6800	0.6774	0.6916	0.7105	0.7309	0.7448	0.7793	0.8335	0.8431	
6	216.82	2.34	0.8691	0.8290	0.7699	0.7248	0.7125	0.7343	0.7639	0.7904	0.8074	0.8201	0.8313	0.8435	0.8496	
5	168.30	2.23	0.8957	0.8596	0.8045	0.7565	0.7433	0.7614	0.8002	0.8301	0.8337	0.8566	0.9105	0.9201	0.9282	
4	130.64	2.12	1.0000	0.9605	0.9045	0.8565	0.8233	0.8665	0.9029	0.9369	0.9600	0.9771	0.9910	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	0.9706	0.9248	0.8982	0.9326	0.9711	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9896	0.9837	0.9917	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.11. Performance data for tank crew: driver (Concluded).

LINE	LOS (HOURS)	TIME GRID LINES (HRS)															
		74.43	100.00	125.00	150.00	175.00	200.00	225.00	250.00	275.00	300.00	325.00	350.00	375.00	400.00	425.00	450.00
16	4529.03	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	5516.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	2720.55	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	2119.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	1408.72	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	1216.71	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	991.04	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	760.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
24	597.16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
25	403.54	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
26	330.02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
27	270.31	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
28	216.02	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
29	160.70	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
30	130.64	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
31	101.01	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
32	74.72	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
33	51.11	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table J.12. Performance data for TOW crew: squad leader.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4520.03	3.66	1.0000	1.0000	0.8099	0.6263	0.4800	0.3635	0.2708	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.24	3.55	1.0000	1.0000	1.0000	0.8011	0.6261	0.4800	0.3635	0.2708	0.1967	0.1378	0.0909	0.0237	0.0000	
16	2720.55	3.44	1.0000	1.0000	1.0000	0.9965	0.8771	0.7915	0.7302	0.6381	0.5245	0.4375	0.3093	0.2531	0.2130	
15	2119.81	3.33	1.0000	1.0000	1.0000	1.0000	0.9281	0.8505	0.8157	0.7282	0.6141	0.5307	0.4573	0.3665	0.3199	
14	1644.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9612	0.8405	0.7810	0.6830	0.5874	0.4933	0.4231	0.3663	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8858	0.8346	0.7543	0.6488	0.5368	0.4809	0.4518	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9140	0.8424	0.7749	0.6827	0.5755	0.5055	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9242	0.8327	0.7939	0.7216	0.6374	
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9037	0.8628	0.8229	0.7459	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9106	0.8462	0.8011	
8	319.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8949	0.8560	
7	219.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8937	0.9111	
6	166.80	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9702	
5	130.64	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	101.41	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	78.72	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	61.11	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4520.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.24	3.55	0.1694	0.1080	0.0623	0.0435	0.0342	0.0251	0.0188	0.0141	0.0100	0.0061	0.0042	0.0027	0.0016	
16	2720.55	3.44	0.2413	0.1673	0.1303	0.0909	0.0749	0.0670	0.0678	0.0768	0.0968	0.1285	0.1715	0.2069	0.2330	
15	2119.81	3.33	0.2733	0.2251	0.1722	0.1672	0.0857	0.0790	0.0770	0.0877	0.1188	0.1711	0.2289	0.2760	0.3249	
14	1644.72	3.22	0.3309	0.3078	0.2205	0.1455	0.1230	0.1194	0.1287	0.1441	0.1783	0.2366	0.2867	0.3359	0.4262	
13	1276.71	3.11	0.4252	0.3863	0.2509	0.2103	0.1771	0.1689	0.1803	0.2051	0.2375	0.2982	0.3411	0.3982	0.5276	
12	991.04	3.00	0.4687	0.4302	0.3165	0.3175	0.2473	0.2214	0.2427	0.2664	0.2920	0.3209	0.3483	0.5102	0.6304	
11	769.29	2.89	0.5671	0.5192	0.4795	0.4367	0.3883	0.3660	0.3911	0.4166	0.4412	0.4665	0.5194	0.6400	0.7252	
10	597.16	2.78	0.6034	0.6045	0.5674	0.5358	0.5035	0.4765	0.4938	0.5172	0.5441	0.5714	0.6463	0.7470	0.7779	
9	463.54	2.67	0.7319	0.6651	0.6174	0.5846	0.5501	0.5182	0.5102	0.5246	0.5535	0.5858	0.6091	0.7772	0.7934	
8	319.82	2.56	0.7822	0.7176	0.6813	0.6216	0.5914	0.5658	0.5509	0.5671	0.5958	0.6268	0.6984	0.7667	0.8088	
7	219.31	2.45	0.8237	0.7679	0.7042	0.6549	0.6324	0.6296	0.6403	0.6560	0.6903	0.7129	0.7504	0.8166	0.8242	
6	166.80	2.34	0.8653	0.8181	0.7471	0.6915	0.6733	0.7001	0.7333	0.7649	0.7847	0.8012	0.8161	0.8325	0.8404	
5	130.64	2.23	0.9564	0.8872	0.8207	0.7664	0.7368	0.7176	0.8130	0.8480	0.8785	0.8881	0.9027	0.9188	0.9246	
4	101.41	2.12	1.0000	0.9581	0.8972	0.8452	0.8121	0.8553	0.8988	0.9297	0.9660	0.9747	0.9902	1.0000	1.0000	
3	78.72	1.90	1.0000	1.0000	0.9700	0.9247	0.8958	0.9320	0.9708	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	61.11	1.79	1.0000	1.0000	1.0000	0.9909	0.9833	0.9923	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.12. Performance data for TOW crew: squad leader (Concluded).

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)											
			79.43 (1.0)	100.00 (2.0)	125.00 (2.1)	150.00 (2.2)	190.53 (2.3)	251.19 (2.4)	316.23 (2.5)	398.11 (2.6)	501.19 (2.7)	630.56 (2.8)	794.33 (2.9)	1000.00 (3.0)
18	4520.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.74	3.55	0.0789	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2720.55	3.44	0.2463	0.1194	0.0264	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.01	3.33	0.3750	0.2669	0.1483	0.0704	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	3.22	0.4007	0.3079	0.2592	0.1314	0.0455	0.0056	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1274.71	3.11	0.6040	0.5112	0.3780	0.2062	0.1528	0.0884	0.0327	0.0000	0.0000	0.0000	0.0000	0.0000
12	901.04	3.00	0.7224	0.6670	0.6081	0.5239	0.3331	0.2361	0.1480	0.0768	0.0000	0.0000	0.0000	0.0000
11	600.29	2.89	0.7803	0.7690	0.7567	0.7262	0.6936	0.6550	0.6137	0.5728	0.5301	0.4861	0.4420	0.4000
10	400.76	2.78	0.7963	0.8035	0.8050	0.7955	0.7855	0.7716	0.7560	0.7409	0.7244	0.7073	0.6895	0.6716
9	250.54	2.67	0.8004	0.8032	0.8000	0.7995	0.7874	0.7720	0.7555	0.7380	0.7201	0.7021	0.6836	0.6646
8	159.82	2.56	0.8051	0.8040	0.8037	0.8043	0.8094	0.8024	0.7938	0.7861	0.7777	0.7691	0.7600	0.7500
7	279.31	2.45	0.8167	0.8161	0.8157	0.8175	0.8312	0.8285	0.8133	0.7981	0.7836	0.7683	0.7520	0.7350
6	216.82	2.34	0.8400	0.8478	0.8493	0.8503	0.8534	0.8546	0.8528	0.8441	0.8356	0.8260	0.8160	0.8060
5	168.30	2.23	0.9320	0.9392	0.9449	0.9502	0.9555	0.9608	0.9658	0.9704	0.9746	0.9783	0.9820	0.9850
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.13. Performance data for TOW crew: Gunner.

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)									
			0.25 (-0.7)	0.50 (-0.6)	0.75 (-0.5)	1.00 (-0.4)	1.25 (-0.3)	1.50 (-0.2)	1.75 (-0.1)	2.00 (0.0)	2.25 (0.1)	2.50 (0.2)
18	4529.03	3.66	1.0000	1.0000	0.8099	0.6243	0.4300	0.2335	0.1378	0.0909	0.0535	0.0237
17	5516.34	3.55	1.0000	1.0000	1.0000	0.8329	0.7710	0.6532	0.5270	0.3996	0.2646	0.1678
16	2729.53	3.44	1.0000	1.0000	1.0000	0.9910	0.8382	0.7306	0.6581	0.5254	0.3928	0.2420
15	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.9062	0.8083	0.7580	0.6516	0.5309	0.4184
14	1648.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9489	0.7955	0.7125	0.5607	0.4335
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8569	0.7819	0.6627	0.5318
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
11	768.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
5	168.30	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
3	101.81	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
2	74.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8500	0.7094	0.5621

GRID LINE	UNSE	LOG(UNSE)	TIME GRID LINES (HRS)									
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)
18	4529.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	5516.34	3.55	0.1126	0.0717	0.0566	0.0478	0.0412	0.0355	0.0301	0.0431	0.0492	0.0547
16	2729.53	3.44	0.1480	0.1119	0.0856	0.0593	0.0490	0.0440	0.0408	0.0511	0.0653	0.0879
15	2118.81	3.33	0.1851	0.1522	0.1185	0.0709	0.0567	0.0526	0.0515	0.0592	0.0815	0.1212
14	1648.72	3.22	0.2590	0.2213	0.1587	0.0985	0.0833	0.0810	0.0874	0.0983	0.1258	0.1794
13	1276.71	3.11	0.3307	0.2888	0.2097	0.1493	0.1254	0.1198	0.1288	0.1489	0.1759	0.2350
12	991.04	3.00	0.4731	0.3353	0.2491	0.2414	0.1862	0.1660	0.1808	0.2049	0.2270	0.2554
11	768.29	2.89	0.6754	0.5084	0.4701	0.4390	0.3088	0.2924	0.3189	0.3418	0.3663	0.3916
10	597.16	2.78	0.8754	0.7766	0.7237	0.6892	0.4994	0.4892	0.4947	0.4335	0.4614	0.4905
9	463.54	2.67	0.9553	0.8766	0.8237	0.7892	0.6200	0.6200	0.6200	0.6200	0.6200	0.6200
8	359.82	2.56	0.7702	0.7008	0.6495	0.6137	0.4994	0.4994	0.4994	0.4994	0.4994	0.4994
7	279.31	2.45	0.8227	0.7622	0.7177	0.6873	0.5800	0.6193	0.6610	0.6997	0.7240	0.7339
6	216.82	2.34	0.9426	0.8951	0.8629	0.8312	0.7012	0.7161	0.7615	0.8047	0.8333	0.8556
5	168.30	2.23	1.0000	0.9451	0.8664	0.7679	0.6629	0.6193	0.6610	0.6997	0.7240	0.7339
4	130.64	2.12	1.0000	0.9451	0.8664	0.7679	0.6629	0.6193	0.6610	0.6997	0.7240	0.7339
3	101.81	2.01	1.0000	1.0000	0.9603	0.8983	0.8628	0.9100	0.9616	1.0000	1.0000	1.0000
2	74.72	1.90	1.0000	1.0000	1.0000	0.9875	0.9780	0.9895	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.13. Performance data for TOW crew: gunner (Concluded).

GRID LINE	DISE	L06(D0SE)	TIME GRID LINES (HRS)												
			79.43 (1.0)	100.00 (2.0)	125.00 (2.1)	150.49 (2.2)	199.53 (2.3)	251.19 (2.4)	310.23 (2.5)	398.11 (2.6)	501.19 (2.7)	630.46 (2.8)	794.33 (2.9)	1000.00 (3.0)	1250.93 (3.1)
18	4520.03	3.06	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	5516.74	3.55	0.0487	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
16	2720.53	3.40	0.1000	0.0021	0.0101	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
15	2119.01	3.33	0.2715	0.2000	0.1063	0.0516	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
14	1640.72	3.22	0.4020	0.3105	0.2074	0.1032	0.0331	0.0036	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
13	1276.71	3.11	0.5323	0.4504	0.3313	0.1711	0.1179	0.0629	0.0234	0.0000	0.0000	0.0000	0.0000	0.0000	
12	991.04	3.00	0.6502	0.5903	0.5404	0.4612	0.2713	0.1628	0.1043	0.0503	0.0000	0.0000	0.0000	0.0000	
11	709.79	2.89	0.7185	0.7065	0.7460	0.7460	0.7284	0.6361	0.3437	0.2882	0.2563	0.0355	0.0000	0.0000	
10	597.10	2.79	0.7392	0.7460	0.7460	0.7460	0.7009	0.6413	0.5337	0.4702	0.3609	0.2083	0.1620	0.0000	
9	403.54	2.67	0.7434	0.7463	0.7463	0.7414	0.7272	0.7086	0.6503	0.5386	0.4584	0.3681	0.3159	0.2025	
8	339.82	2.56	0.7436	0.7462	0.7464	0.7445	0.7334	0.7442	0.7096	0.6091	0.5561	0.5067	0.4519	0.3833	
7	279.31	2.45	0.7624	0.7620	0.7619	0.7600	0.7797	0.7758	0.7559	0.6864	0.6567	0.6303	0.5870	0.5295	
6	216.82	2.34	0.7779	0.8019	0.8039	0.8046	0.8071	0.8074	0.8022	0.7871	0.7726	0.7538	0.7221	0.6758	
5	160.20	2.23	0.8123	0.8209	0.8293	0.8351	0.8417	0.8480	0.8539	0.8594	0.8649	0.8707	0.8775	0.8866	
4	130.44	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.01	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.14. Performance data for TOW crew: driver.

GPIN LINE	DUSE	LOG(DUSE)	TIME GRID LINES (HRS)													
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.79 (-0.1)	1.00 (0.0)	1.24 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)	
18	4520.03	3.66	1.0000	1.0000	0.9999	0.6263	0.4800	0.3635	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000	
17	3516.34	3.55	1.0000	1.0000	1.0000	0.9586	0.9226	0.8536	0.7158	0.6178	0.5123	0.4603	0.4101	0.3459	0.2802	
16	2720.55	3.44	1.0000	1.0000	1.0000	0.9998	0.9459	0.8954	0.8623	0.7782	0.6686	0.5900	0.5267	0.4122	0.3470	
15	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.9698	0.9371	0.9149	0.8510	0.7536	0.6608	0.5823	0.4782	0.4095	
14	1648.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9832	0.9300	0.8685	0.8105	0.7171	0.6209	0.5421	0.4880	
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9521	0.9254	0.8678	0.7767	0.6666	0.6072	0.5655	
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9638	0.9291	0.8619	0.8084	0.7055	0.6295	
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9673	0.9218	0.8588	0.8151	0.7639	
10	597.16	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9588	0.9402	0.9268	0.9088	
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9615	0.9327	0.9088	
8	359.62	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9473	0.9208	0.9357	
7	270.71	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9431	0.9618	
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9879	
5	168.70	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
4	130.44	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

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GPIN LINE	DUSE	LOG(DUSE)	TIME GRID LINES (HRS)													
			3.98 (0.6)	5.01 (0.7)	6.31 (0.8)	7.94 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)	
18	4520.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
17	3516.34	3.55	0.2195	0.1305	0.0989	0.0809	0.0677	0.0561	0.0551	0.0638	0.0798	0.1032	0.1519	0.1439	0.1124	
16	2720.55	3.44	0.2828	0.2059	0.1526	0.0995	0.0793	0.0689	0.0663	0.0768	0.1059	0.1538	0.2202	0.2665	0.2792	
15	2118.81	3.33	0.3462	0.2615	0.2064	0.1181	0.0908	0.0818	0.0776	0.0896	0.1321	0.2046	0.2844	0.3634	0.4458	
14	1648.72	3.22	0.4368	0.3834	0.2754	0.1684	0.1383	0.1330	0.1367	0.1633	0.2050	0.2800	0.3483	0.4174	0.5360	
13	1276.71	3.11	0.5252	0.4819	0.3800	0.2535	0.2075	0.1953	0.2042	0.2391	0.2774	0.3520	0.4007	0.4758	0.6277	
12	991.04	3.00	0.5823	0.5343	0.4868	0.3909	0.2966	0.2808	0.2859	0.3149	0.3440	0.3777	0.4092	0.4700	0.7365	
11	769.29	2.89	0.6463	0.6434	0.5958	0.5431	0.4808	0.4496	0.4747	0.5042	0.5300	0.5563	0.6098	0.7407	0.8297	
10	597.16	2.78	0.7999	0.7427	0.7012	0.6843	0.6264	0.5911	0.6076	0.6317	0.6574	0.6835	0.7557	0.8517	0.8761	
9	463.54	2.67	0.8554	0.7976	0.7510	0.7117	0.6746	0.6371	0.6251	0.6385	0.6667	0.6971	0.7748	0.8738	0.8867	
8	359.62	2.56	0.8894	0.8414	0.7894	0.7503	0.7170	0.6906	0.6698	0.6789	0.7059	0.7355	0.8054	0.8883	0.8973	
7	270.71	2.45	0.9157	0.8782	0.8274	0.7865	0.7592	0.7561	0.7570	0.7724	0.7926	0.8131	0.8541	0.9012	0.9078	
6	216.82	2.34	0.9420	0.9138	0.8653	0.8277	0.8314	0.8314	0.8444	0.8659	0.8793	0.9008	0.9029	0.9141	0.9208	
5	168.70	2.23	0.9615	0.9491	0.9075	0.8713	0.8532	0.8605	0.8697	0.8823	0.9460	0.9528	0.9511	0.9565	0.9625	
4	130.44	2.12	1.0000	0.9841	0.9490	0.9210	0.9059	0.9313	0.9527	0.9648	0.9889	0.9938	0.9965	1.0000	1.0000	
3	101.41	2.01	1.0000	1.0000	0.9875	0.9680	0.9575	0.9720	0.9880	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
2	78.72	1.90	1.0000	1.0000	1.0000	0.9969	0.9953	0.9974	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table J.14. Performance data for TOW crew: driver (Concluded).

LPI TIME	LISE	LOG(UNSE)	TIME GRID LINES (HRS)											
			79.43 (1.0)	100.00 (2.0)	125.00 (3.0)	150.00 (4.0)	175.00 (5.0)	200.00 (6.0)	225.00 (7.0)	250.00 (8.0)	275.00 (9.0)	300.00 (10.0)	325.00 (11.0)	350.00 (12.0)
18	4520.03	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	5516.34	3.55	0.1012	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2709.55	3.44	0.3510	0.1702	0.0375	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.41	3.23	0.5324	0.3002	0.2103	0.0387	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	3.02	0.6221	0.4985	0.3302	0.1437	0.0474	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1216.71	2.81	0.7133	0.6194	0.4597	0.2642	0.1694	0.0940	0.0303	0.0000	0.0000	0.0000	0.0000	0.0000
12	991.04	2.60	0.8242	0.7763	0.6214	0.4322	0.3919	0.2678	0.1611	0.0779	0.0000	0.0000	0.0000	0.0000
11	799.24	2.39	0.8761	0.8072	0.6601	0.4322	0.6789	0.5799	0.4769	0.4067	0.3567	0.3067	0.2567	0.2067
10	597.10	2.18	0.8000	0.6938	0.5961	0.4894	0.8652	0.8190	0.7374	0.6480	0.5202	0.3983	0.2764	0.1545
9	403.54	1.97	0.6917	0.5936	0.4944	0.3914	0.8618	0.8694	0.8257	0.7183	0.6313	0.5170	0.4641	0.3914
8	359.82	1.76	0.5961	0.4956	0.3906	0.2951	0.8944	0.8934	0.8689	0.7886	0.7374	0.6924	0.6134	0.4949
7	270.31	1.55	0.5050	0.4056	0.3056	0.2066	0.9150	0.9128	0.9005	0.8589	0.8391	0.8172	0.7386	0.6251
6	216.82	1.34	0.4239	0.3236	0.2236	0.1236	0.9315	0.9322	0.9320	0.9292	0.9261	0.9135	0.8639	0.7552
5	168.30	1.13	0.3072	0.2074	0.1074	0.0000	0.9739	0.9766	0.9793	0.9819	0.9845	0.9894	0.9894	0.9894
4	130.64	0.92	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	0.71	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	0.50	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	0.29	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.15. Performance data for TOW crew: loader.

GRID LINE	UNSE	LNU(UNSE)	TIME GRID LINES (HRS)												
			0.20 (-0.7)	0.25 (-0.6)	0.32 (-0.5)	0.40 (-0.4)	0.50 (-0.3)	0.63 (-0.2)	0.70 (-0.1)	1.00 (0.0)	1.26 (0.1)	1.58 (0.2)	2.00 (0.3)	2.51 (0.4)	3.16 (0.5)
18	4529.93	3.66	1.0000	1.0000	1.0000	0.6263	0.4800	0.3835	0.2706	0.1967	0.1378	0.0909	0.0535	0.0237	0.0000
17	3516.34	3.55	1.0000	1.0000	1.0000	0.8907	0.8361	0.7020	0.4681	0.3035	0.2639	0.2312	0.2009	0.1638	0.1360
16	2729.52	3.44	1.0000	1.0000	1.0000	0.9472	0.8849	0.7834	0.6593	0.5230	0.4046	0.3367	0.2889	0.2054	0.1730
15	2118.81	3.33	1.0000	1.0000	1.0000	1.0000	0.9508	0.8649	0.8155	0.7019	0.5450	0.4204	0.3231	0.2470	0.2110
14	1640.72	3.22	1.0000	1.0000	1.0000	1.0000	1.0000	0.9640	0.8515	0.7710	0.6352	0.5005	0.3740	0.3033	0.2673
13	1276.71	3.11	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8944	0.8002	0.7275	0.5833	0.4347	0.3786	0.3282
12	991.04	3.00	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9211	0.8490	0.7569	0.6293	0.4862	0.3900
11	769.29	2.89	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9298	0.8378	0.7844	0.6916	0.5900
10	597.10	2.78	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9112	0.8720	0.8324	0.7387
9	463.54	2.67	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9172	0.8563	0.8062
8	359.82	2.56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9942	0.9028	0.8630
7	279.31	2.45	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9851	0.9183
6	216.82	2.34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9739
5	168.20	2.23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

GRID LINE	UNSE	LOW(UNSE)	TIME GRID LINES (HRS)												
			3.98 (0.6)	5.01 (0.7)	6.51 (0.8)	7.98 (0.9)	10.00 (1.0)	12.59 (1.1)	15.85 (1.2)	19.95 (1.3)	25.12 (1.4)	31.62 (1.5)	39.81 (1.6)	50.12 (1.7)	63.10 (1.8)
18	4529.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	3516.34	3.55	0.1017	0.0573	0.0392	0.0308	0.0250	0.0207	0.0216	0.0248	0.0289	0.0338	0.0459	0.0448	0.0340
16	2729.52	3.40	0.1389	0.0981	0.0660	0.0401	0.0311	0.0271	0.0264	0.0313	0.0406	0.0555	0.0781	0.0961	0.1063
15	2118.81	3.33	0.1762	0.1300	0.0940	0.0695	0.0372	0.0335	0.0323	0.0379	0.0526	0.0773	0.1103	0.1475	0.1956
14	1640.72	3.22	0.2370	0.1986	0.1308	0.0711	0.0574	0.0355	0.0371	0.0699	0.0900	0.1225	0.1545	0.1979	0.2923
13	1276.71	3.11	0.2984	0.2567	0.1779	0.1116	0.0889	0.0828	0.0896	0.1057	0.1271	0.1656	0.1959	0.2517	0.4011
12	991.04	3.00	0.3442	0.2952	0.2402	0.1674	0.1329	0.1113	0.1253	0.1418	0.1600	0.1865	0.2003	0.3814	0.5221
11	769.29	2.89	0.4006	0.4118	0.3670	0.3155	0.2684	0.2462	0.2687	0.2916	0.3144	0.3381	0.4031	0.5570	0.6493
10	597.10	2.78	0.6143	0.5265	0.4674	0.4235	0.3787	0.3325	0.3701	0.3983	0.4226	0.4525	0.5528	0.6899	0.7861
9	463.54	2.67	0.7055	0.6108	0.5324	0.4833	0.4353	0.3987	0.3871	0.4011	0.4326	0.4685	0.5770	0.7238	0.7793
8	359.82	2.56	0.7703	0.6818	0.6073	0.5390	0.4920	0.4574	0.4444	0.4569	0.4888	0.5254	0.6168	0.7548	0.7793
7	279.31	2.45	0.8227	0.7408	0.6621	0.5954	0.5409	0.5482	0.5656	0.5905	0.6184	0.6471	0.6967	0.7830	0.8006
6	216.82	2.34	0.8752	0.8176	0.7269	0.6519	0.6128	0.6451	0.6867	0.7241	0.7480	0.7689	0.7893	0.8112	0.8230
5	168.20	2.23	0.9600	0.8880	0.8096	0.7459	0.7096	0.7846	0.7971	0.8305	0.8675	0.8851	0.8890	0.9043	0.9170
4	130.64	2.12	1.0000	0.9584	0.8941	0.8392	0.8088	0.8441	0.8937	0.9237	0.9677	0.9819	0.9888	1.0000	1.0000
3	101.41	2.01	1.0000	1.0000	0.9728	0.9317	0.9068	0.9309	0.9741	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	0.9928	0.9892	0.9980	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	61.11	1.79	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table J.15. Performance data for TOW crew: loader (Concluded).

GRIN LINE	UNSE	LOG(UNSE)	TIME GRIN LINES (HRS)											
			79.43 (1.0)	100.00 (2.0)	125.09 (2.1)	150.49 (2.2)	190.53 (2.3)	251.19 (2.4)	316.23 (2.5)	398.11 (2.6)	501.19 (2.7)	630.96 (2.8)	794.33 (2.9)	1000.00 (3.0)
18	4520.93	3.66	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	5516.34	3.55	0.0328	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
16	2729.55	3.44	0.1382	0.0655	0.0117	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
15	2118.01	3.32	0.2507	0.1087	0.0693	0.0376	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
14	1644.72	3.22	0.3661	0.2739	0.1794	0.0756	0.0231	0.0026	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
13	1276.71	3.11	0.4936	0.4027	0.2654	0.1324	0.0907	0.0484	0.0163	0.0000	0.0000	0.0000	0.0000	0.0000
12	941.04	3.00	0.6472	0.5660	0.3644	0.4434	0.2286	0.1304	0.0791	0.0354	0.0000	0.0000	0.0000	0.0000
11	769.29	2.89	0.7331	0.7216	0.7098	0.6799	0.5333	0.4280	0.3332	0.2823	0.2319	0.0239	0.0000	0.0000
10	597.16	2.78	0.7614	0.7729	0.7800	0.7728	0.7358	0.6491	0.5523	0.4722	0.3505	0.1770	0.1342	0.0000
9	463.54	2.67	0.7684	0.7725	0.7747	0.7708	0.7535	0.7134	0.6482	0.5399	0.4559	0.3537	0.2990	0.0914
8	359.22	2.56	0.7776	0.7750	0.7737	0.7723	0.7726	0.7613	0.7195	0.6175	0.5667	0.5184	0.4581	0.2710
7	279.31	2.45	0.7988	0.7953	0.7956	0.7956	0.8008	0.8074	0.7651	0.7237	0.6945	0.6641	0.6138	0.4450
6	216.92	2.34	0.8317	0.8380	0.8424	0.8454	0.8490	0.8535	0.8518	0.8427	0.8309	0.8097	0.7695	0.6200
5	164.70	2.23	0.9272	0.9357	0.9428	0.9491	0.9552	0.9610	0.9641	0.9705	0.9748	0.9779	0.9817	1.0000
4	130.64	2.12	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
3	101.01	2.01	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2	78.72	1.90	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
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